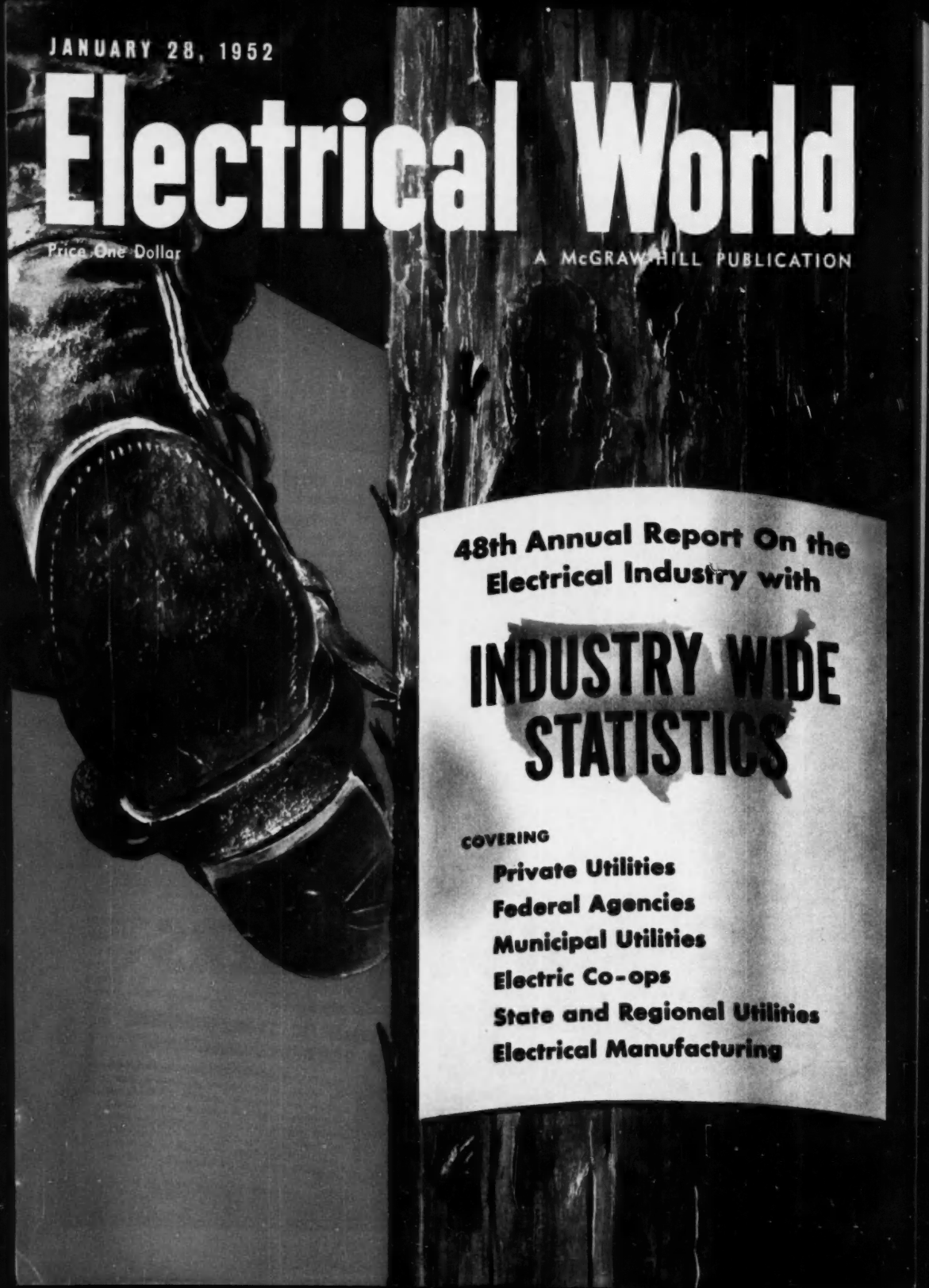
JANUARY 28, 1952

Electrical World

Price One Dollar

A McGRAW-HILL PUBLICATION



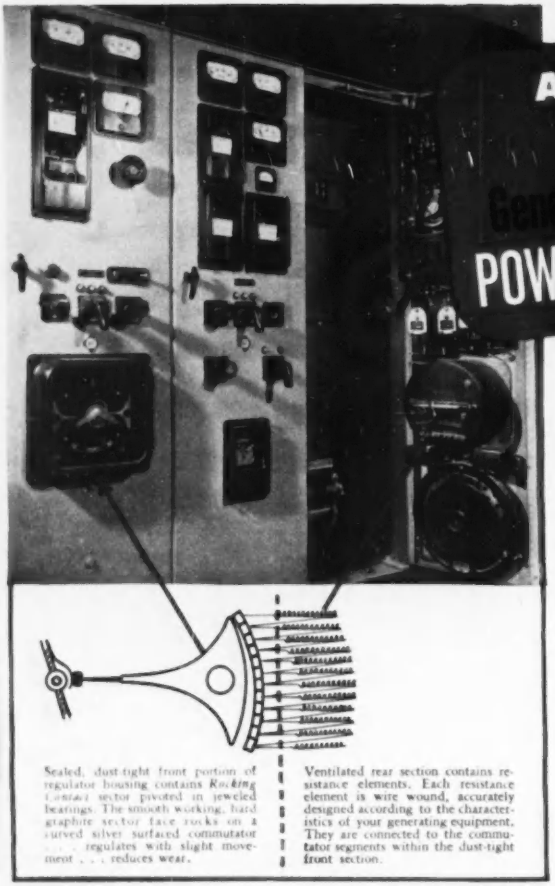
48th Annual Report On the Electrical Industry with

INDUSTRY WIDE STATISTICS

COVERING

- Private Utilities
- Federal Agencies
- Municipal Utilities
- Electric Co-ops
- State and Regional Utilities
- Electrical Manufacturing

HOLDS VOLTAGE within ½ of 1%



Sealed, dust-tight front portion of regulator housing contains *Rocking Contact* sector pivoted in jeweled bearings. The smooth working, hard graphite sector face rocks on a curved silver surfaced commutator . . . regulates with slight movement . . . reduces wear.

Ventilated rear section contains resistance elements. Each resistance element is wire wound, accurately designed according to the characteristics of your generating equipment. They are connected to the commutator segments within the dust-tight front section.

ALLIS-CHALMERS

Rocking Contact Generator Voltage Regulator

POWER PLANT CONTROL

YEAR AFTER YEAR, regardless of line or load disturbances, proper voltage is accurately maintained. This is the kind of performance you can expect from *Rocking Contact* Voltage Regulators . . . it is the kind of performance users are getting!

"Regulation is tops!" says one user. "Put in service ten years ago and still no sign of needed maintenance," says another. "Not one penny for maintenance in fifteen years of continuous service," says still another.

And there is a reason for this trouble-free performance. *Rocking Contact* Voltage Regulators are precision built . . . require no delicate adjustments. *Rocking Contact* sectors are supported in jeweled bearings, rock on carefully machined commutator segments heavily plated with silver. Just a slight *rocking* motion regulates voltage by varying resistance in the exciter shunt field circuit. Response is fast . . . regulation accurate to within ½ of 1%.

Rocking Contact Regulators stay accurate . . . operate for years without repair or maintenance. Call your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin for more information.

A-3269

Rocking Contact, Regulex and Synchro-Operator are Allis-Chalmers trademarks.

ALLIS-CHALMERS

ROTATING GENERATOR VOLTAGE REGULATOR

REGULEX Generator Voltage Regulators are recommended for use with large generators where field forcing and extremely fast response are required. High amplification of small changes produces immediate, strong corrective action. Similar to a dc generator in construction, it has nothing to get out of adjustment . . . replaces pilot exciter.

AUTOMATIC SYNCHRONIZER FOR ROTATING MACHINERY

The SYNCHRO-OPERATOR automatically brings the speed of synchronous condensers, alternators and frequency changers to synchronism. While doing so, it indicates relative speed, which machine is faster, phase angle between machines, and the exact point of synchronism. Breaker is automatically closed at the exact point of synchronism. Send for leaflet 14563868.

THE BIG CONVENTION

Last week, electrical engineers from the four corners of the U. S. and abroad thronged into New York, 3,000 strong, to attend the 40th annual AIEE Winter General Meeting. They spent a busy week attending 67 sessions, listening to 277 technical papers, and taking part in the activities of more than half a hundred committees.

Electrical World's staff was there too—nine editors and photographers. Readers will find proof in the news pages of this very issue where they may read what Defense Mobilizer C. E. Wilson had to say to them about "Building Toward Strength."

For the engineers who couldn't attend, Electrical World's Feb. 11 issue will carry an 8-page report of the technical discussions. Whether or not you were there, you'll find it worth reading to check what went on at sessions you missed.

For Twenty Years . . .

. . . Atlantic City Electric Co and E. I. duPont de Nemours & Co have been working together under a plan unique to the electrical industry. The utility sells 1,200-psi steam to duPont, but passes it through a turbogenerator before delivery. Thus duPont gets steam at 200 psi as well as the output of the generating unit. Atlantic City Electric owns and operates the equipment; duPont pays a rental and operating costs.

Instead of exchanging gifts and compliments to mark 20 years of cooperation, the two concerns observed the event with a 10-year contract. Read about this singular and inspiring venture in Electrical World of Feb. 11.

This Way Out?

Utility engineers have long recognized that service is improved generally by connecting transmission lines to multiple source buses. But this very step can produce sustained service outage on a faulted feeder, especially if division of fault current among the remaining feeders is less than the normal rated current of each.

For a way out of this seeming impasse, read "Give Complete Backup Protection to Transmission Lines" by A. J. McConnell, in the Feb. 11 issue.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing or applying electric power

Vol. 137 No. 4 **CONTENTS** **January 28, 1952**

Editorials 109

News

The Electrical Week	111	Financial News	118
Washington Comment	112	News About People	219
Technical Notes	112	Manufacturers & Markets	226
New Electrical Construction	230		

48th ANNUAL STATISTICAL ISSUE 121

OUTSTANDING FACTS	122	MAINTENANCE	139
SUMMARY	123	CUSTOMERS	140
BUDGET	125	ENERGY SALES	142
CAPACITY	128	REVENUE	144
CAPACITY BY REGIONS	130	OUTPUT	146
NEW CAPACITY	131	STATION ECONOMICS	148
TRANSMISSION & DISTRIBUTION	134	LABOR	150
RURAL ELECTRIFICATION	136	MANUFACTURING	152
FINANCIAL	154		

Departments

How To	160	What They're Saying	212
Engineering Reference Sheet	168	Catalogs	234
Industrial Applications	182	Book Reviews	238
Sales and Service	186	Technical Literature	242
New Equipment	192	Index of Advertisers	247
Letters	252		

RALPH H FLYNN, Publisher FISCHER BLACK, Editor DANIEL T BRAYMER, Managing Editor

A E KNOWLTON ..... Senior Associate Editor
FRANK R INNES ..... Associate Editor
ROBERT C BLATT ..... Associate Editor
KENNETH K KOST ..... Associate Editor
HERBERT FRANKEL ..... Associate Editor
DALLAS MALLARD ..... Art Director
EDWARD ALLEN ..... Midwestern Editor
HOWARD S KNOWLTON ..... New England Editor
JOSEPH A ROBINSON ..... Western Editor
RUE M SHOOP ..... Middle Eastern Editor
FRANCIS J KOVALCIK ..... Assistant Editor
JOHN F WICKLEIN ..... News Editor
JEANNE BERNHARDT ..... Assistant News Editor
GREGORY HAGOPIAN ..... Assistant Editor
ARY MOSSIMAN ..... Statistician
JESSE MOCK ..... Washington Correspondent

WORLD NEWS BUREAU, Russell F Anderson, Editor; London, Paris, Frankfurt, Moscow, Tokyo, Bombay, Melbourne, Rio de Janeiro, Buenos Aires • DOMESTIC NEWS SERVICE, Atlanta, Chicago, Cleveland, Detroit, San Francisco, Houston. Correspondents in 43 principal cities • ECONOMICS DEPARTMENT, Dexter M Keezer, Director; Robert P Ulin

ADVERTISING STAFF: District Managers, E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; E S Chapin, Detroit; W H Meneilley, Chicago; J T Schaefer, St. Louis

January 28, 1952 ELECTRICAL WORLD Vol. 137, No. 4
Member ABC and ABP

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Executive, Editorial and Advertising Office: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.

Single copies $1.00. For the United States and possessions $6 a year, $9 for two years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Pan-American countries, $15 for one year, $25 for two years, $35 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in USA. Copyright 1952, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

In Electrical Contact Assemblies...

MALLORY Assembly Engineering

can mean three-way savings for you

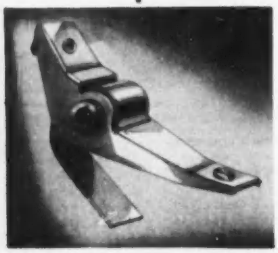
No matter what your contact assembly needs may be, Mallory can do the *whole* job for you—from design and material selection . . . to fabrication and finishing of parts . . . to final assembly.

Mallory assembly engineering is backed by 25 years of research and practical experience and takes pride in . . .

- Design of more than 5000 different types of contacts.
- Development of many special alloys . . . and brazing techniques.
- Leadership in the development and practical application of powder metallurgy.
- Design and production of all types of switches.

With this specialized electrical and metallurgical engineering experience working for you, you save three ways—in better performance . . . in reduced costs . . . and in relief from the design, handling, scheduling and inventory control problems involved in assembling your own contact units.

EXPECT MORE . . . GET MORE FROM MALLORY



An example of Mallory contact assembly engineering is a tungsten contact assembly for an outboard motor magneto which had to withstand the impact of millions of cycles . . . resist salt water corrosion . . . maintain constant shape and uniform spring action . . . and hold the precise tolerances despite temperature and humidity changes.

Mallory engineers produced the right answer at the right price—a contact assembly that is doing an outstanding job. You can expect the same kind of results when you turn your contact assembly work over to Mallory.

In Canada, made and sold by Johnson Matthey & Mallory Ltd., 110 Industry St., Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

SERVING INDUSTRY WITH

Electromechanical Products

Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products

Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products

Contacts *Special Metals*
Welding Materials

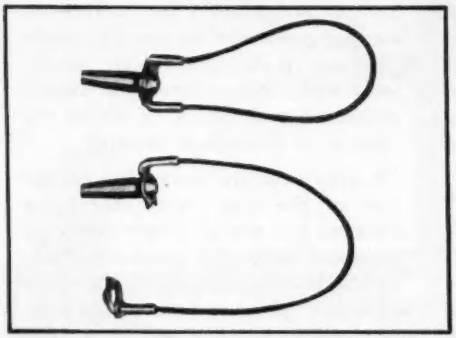
P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable



THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

SELECT TO DESIGNATE QUALITY TO PRODUCT

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

Alduti Interrupter Switches

PERMIT ARC-FREE

The practice of mounting sectionalizing switches upright to provide arc clearance is often inconvenient and costly. This is especially true where a vertical conductor configuration is used. In this case, the transposition of conductors into the horizontal plane for pole top switching requires a longer span and a higher pole; and the wide spacing demanded by horn gap switches often results in a costly supporting structure.

On the other hand, with the installation of an Alduti Interrupter Switch vertical conductor configuration, regular span lengths and regular pole height can be retained. In many cases the installation can be made on an existing line pole, and no switch supporting structure other than the pole itself is needed.

Because Alduti Interrupter Switches operate without external arcing there is no limitation imposed on line design to provide arcing clearance for switches. Switch configuration can conform to the configuration of the line. This opens the door to development of "unconventional" improvements in switch mounting techniques, of which the illustration is a typical example.

Yet these structural advantages are but part of the story. With interrupter switches you are no longer restricted to present sectionalizing practices. Feeders and branch lines can now be safely switched without sequencing with breakers or dropping individual loads —because Alduti Interrupter Switches interrupt not only line or cable charging currents, but also 600 amperes of load current.

Why not discuss with your S&C sales representative the advantages of this new kind of sectionalizing switching.

Alduti Interrupter Switches are supplied in the following ratings:

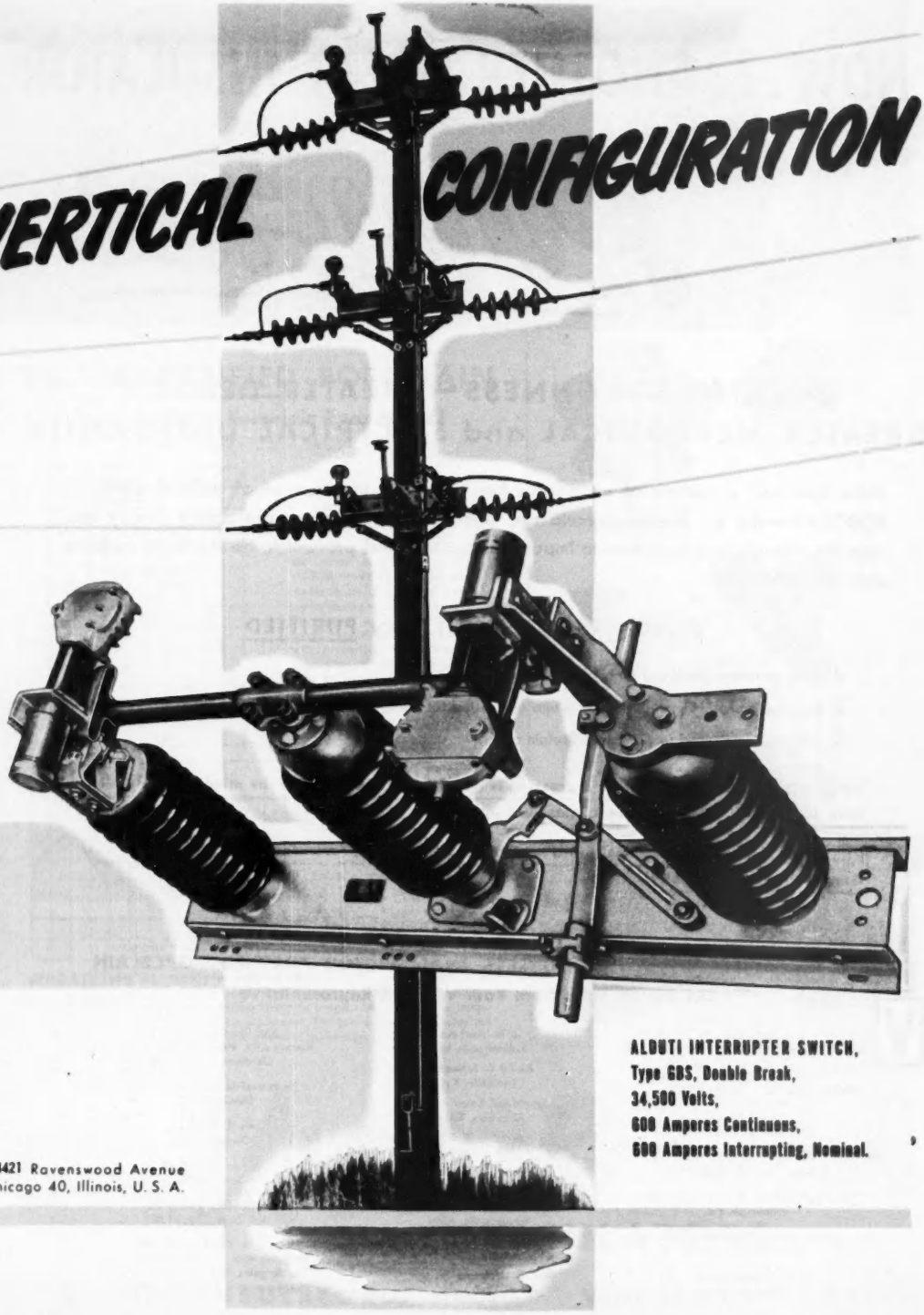
Volts	Amperes Continuous	Amperes Interrupting, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

Formerly SCHWEITZER & CONRAD, INC.

In Canada, Powerlite Devices, Limited, Toronto

VERTICAL CONFIGURATION



ALBUTI INTERRUPTER SWITCH,
Type GBS, Double Break,
34,500 Volts,
600 Amperes Continuous,
600 Amperes Interrupting, Nominal.

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

NOW... ANOTHER GREAT INSULATOR

PURIFIED

GREATER TOUGHNESS—GREATER DENSITY
GREATER MECHANICAL and ELECTRICAL UNIFORMITY

More than half a century of experience has gone into the creation of VICTOR PURIFIED PORCELAIN—the wet process porcelain of highest insulation values, unequalled density and rock-like strength and resistance to impact. Laboratory tests prove it to be the finest insulator porcelain ever made!

VICTOR PORCELAIN Is Truly PURIFIED

1. Only premium grades of flint, feldspar and clay are used.
2. Every shipment is stored in separate bins and tested for purity and uniformity before using.
3. All clay is de-aired to achieve porcelain of maximum density.

AND NOW... **all water used in processing is de-mineralized to remove the mineral salts which fuse during firing into microscopic, glass-like impurities!**

RESULTS: **Increased Impact Resistance... Greater Density... Greater Manufacturing Control... Greater Product Uniformity!**

DON'T SETTLE FOR ANYTHING LESS THAN VICTOR PURIFIED PORCELAIN

Get All the Facts from Your VICTOR Representative

V

J. A. Perkins Co.
Boston (Westwood), Mass.

T. B. Dolly
New York, N. Y., Jersey City, N. J.

John J. Herrity
Washington, D. C.

L. Morris Landers Co.
Atlanta, Ga., Charlotte, N. C.

Continental Sales & Engineering Co.
Pittsburgh, Pa.

Public Service Supply Co., Inc.
Cleveland, Ohio

H. J. Schwarberg
Cincinnati, Ohio

L. M. Rudbeck
Indianapolis, Ind.

David D. Schneider
Louisville, Ky.

Southland Sales Agents
Memphis, Tenn.

Braisted & Bair
Detroit, Mich.

Galde & Dunlap
Chicago, Ill.

Alton M. Johnson Co.
Minneapolis, Minn.

H. R. Koch Co.
St. Louis, Mo.

F. R. Hearn Co.
St. Louis, Mo.

The Chas. L. Ward Co.
Kansas City, Mo., Des Moines, Iowa
Oklahoma City, Okla.

Southwest Sales & Service Co.
Shreveport, La.

Geo. E. Tarbox Co.
Denver, Colo.

Myron Swendsen
Boise, Idaho

Conely Engineering Co.
Salt Lake City, Utah

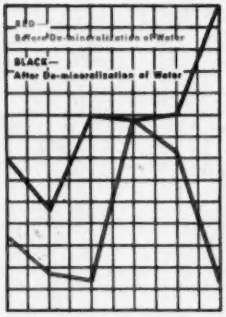
Maydwell & Hartzell, Inc.
Phoenix, Ariz., San Francisco, Cal.
Los Angeles, Cal., Portland, Ore.
Spokane, Wash., Seattle, Wash.

ADVANCE FROM VICTOR — PORCELAIN!

VICTOR PURIFIED PORCELAIN

Finest Insulator Porcelain Ever Made!

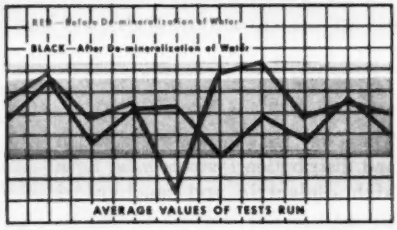
LABORATORY TESTS PROVE IT!



Results of Mechanical Impact Tests

MECHANICAL IMPACT TESTS*

Removal of mineral salts from the water used in processing VICTOR PURIFIED PORCELAIN results in an average of 18% higher mechanical impact values. The graph at the left shows actual values obtained from tests preceding and following installation of water de-mineralizing equipment.

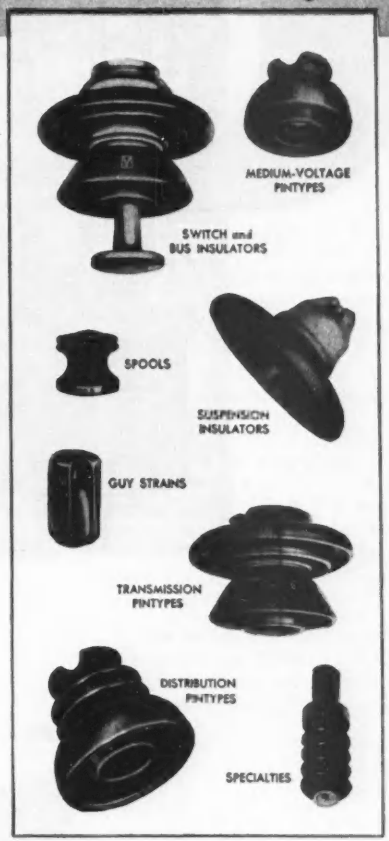


Results of M & E Strength Tests Showing Range of Variation

M&E STRENGTH TESTS*

Installation of water de-mineralizing equipment shows an improvement of 24% in the range of variation of M & E strength values over the range obtained before installation of this equipment. The graph above indicates the remarkable increase in uniformity of product.

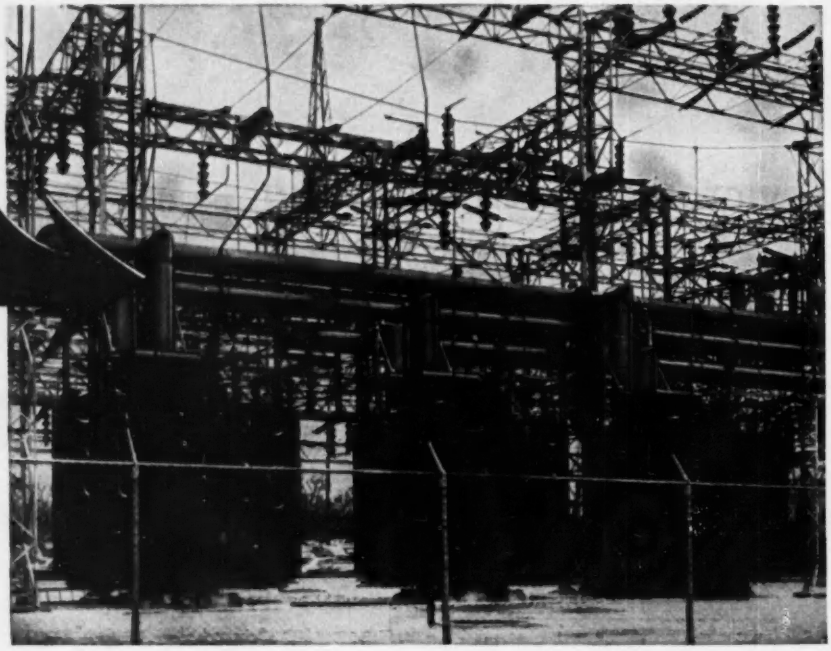
*Tests made on VICTOR 10", 15,000 lb. suspension insulator.



VICTOR INSULATORS

VICTOR INSULATORS, INC. • VICTOR, NEW YORK

FIRST STEP
OWARD SERVICE CONTINUITY...

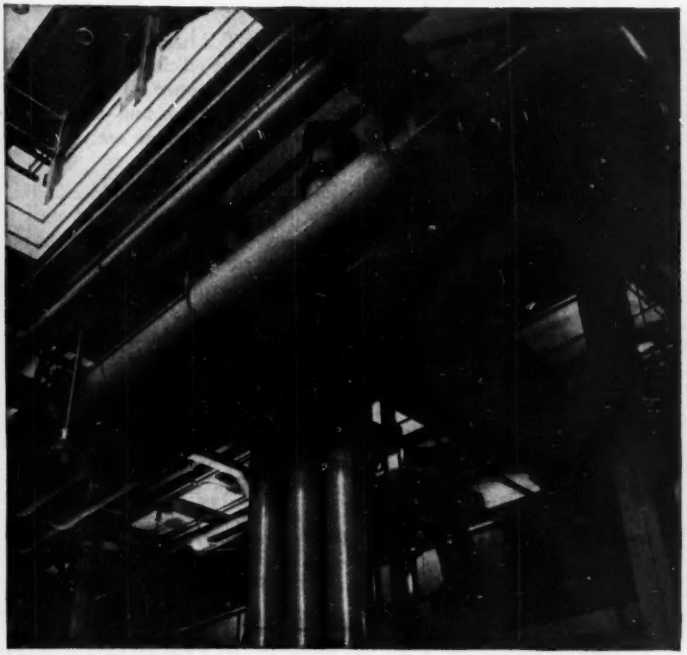


Generator leads—

that satisfy your requirements

These key links in power generation and distribution systems must have high dielectric and mechanical strength. I-T-E Isolated Phase Bus is designed and built to meet all the electrical and mechanical essentials.

I-T-E Isolated Phase Bus can be used indoors or outdoors—on long runs or short runs. It can be threaded through complicated mazes of piping and conduit. Connections to transformers and other auxiliary equipment are neat and easy.



easy-to-order

Working from a simple, single line diagram of your circuit and building, I-T-E supplies finished drawings and a quotation for a complete bus.

And the bus production capacity of I-T-E and its R&IE Equipment Division is sufficient to satisfy the requirements of all the generators now being produced in the United States.

easy-to-install

Readily adaptable to any building contour, I-T-E Isolated Phase Bus may be furnished in sections of three phase units, when required. It may also be delivered as packaged parts—to meet particular installation problems.

proved in service

I-T-E Isolated Phase Bus has been transmitting the power from the largest generators since 1936. Over 24 conductor-miles in 213 installations are in service today.

For further information, write for Catalog Section 10004. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania.

I-T-E

ISOLATED PHASE BUS

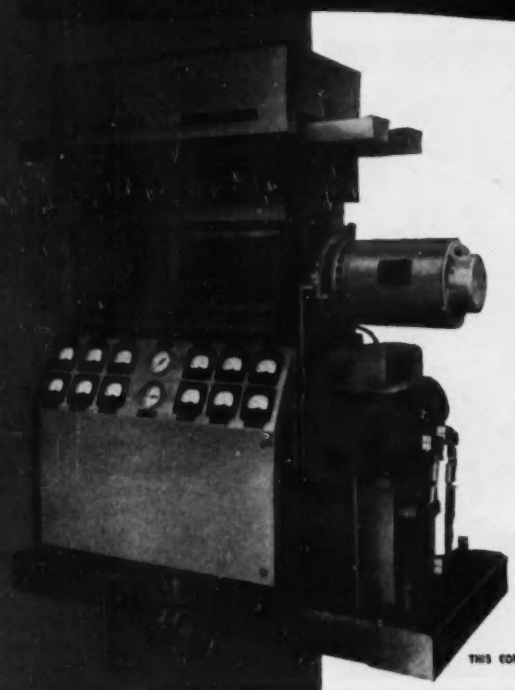
Power Switching Equipment:
R&IE Equipment Division, Greensburg, Pa.

Canadian Mfg. and Sales:
Eastern Power Devices, Ltd., Toronto

Export Sales:
Philips Export Corp., N. Y., N. Y.

SULTING ENGINEERS! INDUSTRIAL D-C USERS!

HERE'S A SOURCE OF



THIS CONTACT MECHANISM, 57 INCHES IN HEIGHT, DELIVERS 10,000 D-C AMPERES AT 250 VOLTS

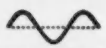
For the last five years, I-T-E has been supplying U. S. industry with a highly efficient Mechanical Rectifier for producing d-c power. Over-all efficiencies—from a-c source to d-c bus—of 94 to 96% within a 50 to 400 volt range are routine with the I-T-E Mechanical Rectifier.

First U. S. installation of the I-T-E Mechanical Rectifier was made at the Buffalo Electro-Chemical Corporation. That company now has seven Mechanical Rectifiers. The success of the installation convinced other heavy d-c users that I-T-E Mechanical Rectifiers are an ideal source of low cost d-c power. This means I-T-E Mechanical Rectifiers should be given ever increasing consideration when planning new rectification installations.

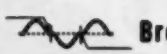
As indicated in the series of diagrams below, basic theory of the I-T-E Mechanical Rectifier is simple. For a complete description of the Mechanical Rectifier, its operation, dimensions, and typical operating curves, write for Bulletin 5106. The I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Phila. 30, Pa.

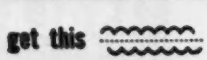
I-T-E MECHANICAL RECTIFIERS OFFER THESE ADVANTAGES

- ***HIGH EFFICIENCY***
  Superior in 50-400 d-c volt range
- ***SMALL SPACE REQUIREMENT***
  Compact design, neat appearance
- ***LOW BUILDING INVESTMENT***
  No need for special construction
- ***LOW INSTALLATION COST***
  Install rectifier, connect, operate
- ***AVAILABILITY FOR SERVICE***
  No warming-up or speed-up period
- ***LOW MAINTENANCE COST***
  Minimum main contact replacement
- ***RUGGED TRANSFORMERS***
  Conservative, modern design
- ***SIMPLE VOLTAGE CONTROL***
  Voltage or current controlled automatically between ± 1%

Take a sine wave 

Modify it like this

Make contact here  **Break contact here**

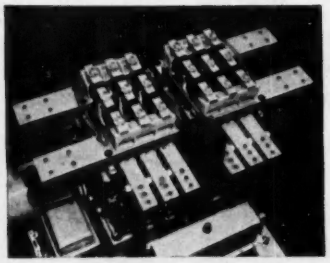
Do this 1,296,000 times an hour and get this 

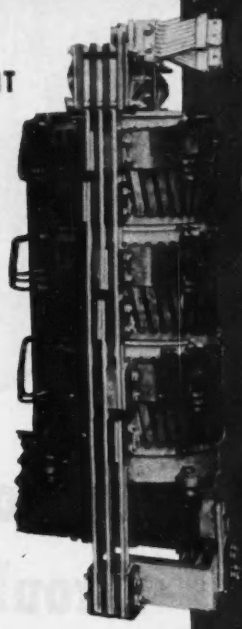
With a conversion efficiency of 96% or higher!

LOW-COST D-C POWER!

HERE ARE THE HIGHLIGHTS OF

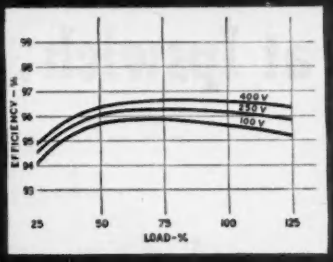
I-T-E MECHANICAL RECTIFIER EQUIPMENT

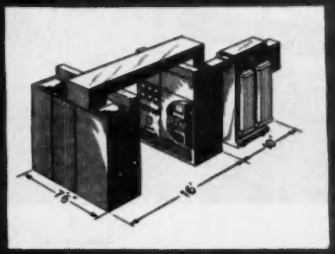




EASY CONTACT ADJUSTMENT

Contact replacement, when necessary, is quickly done because each contact is a unit assembly installed by tightening two bolts. Contact adjustment can be made while the mechanism is operating and under load.





I-T-E

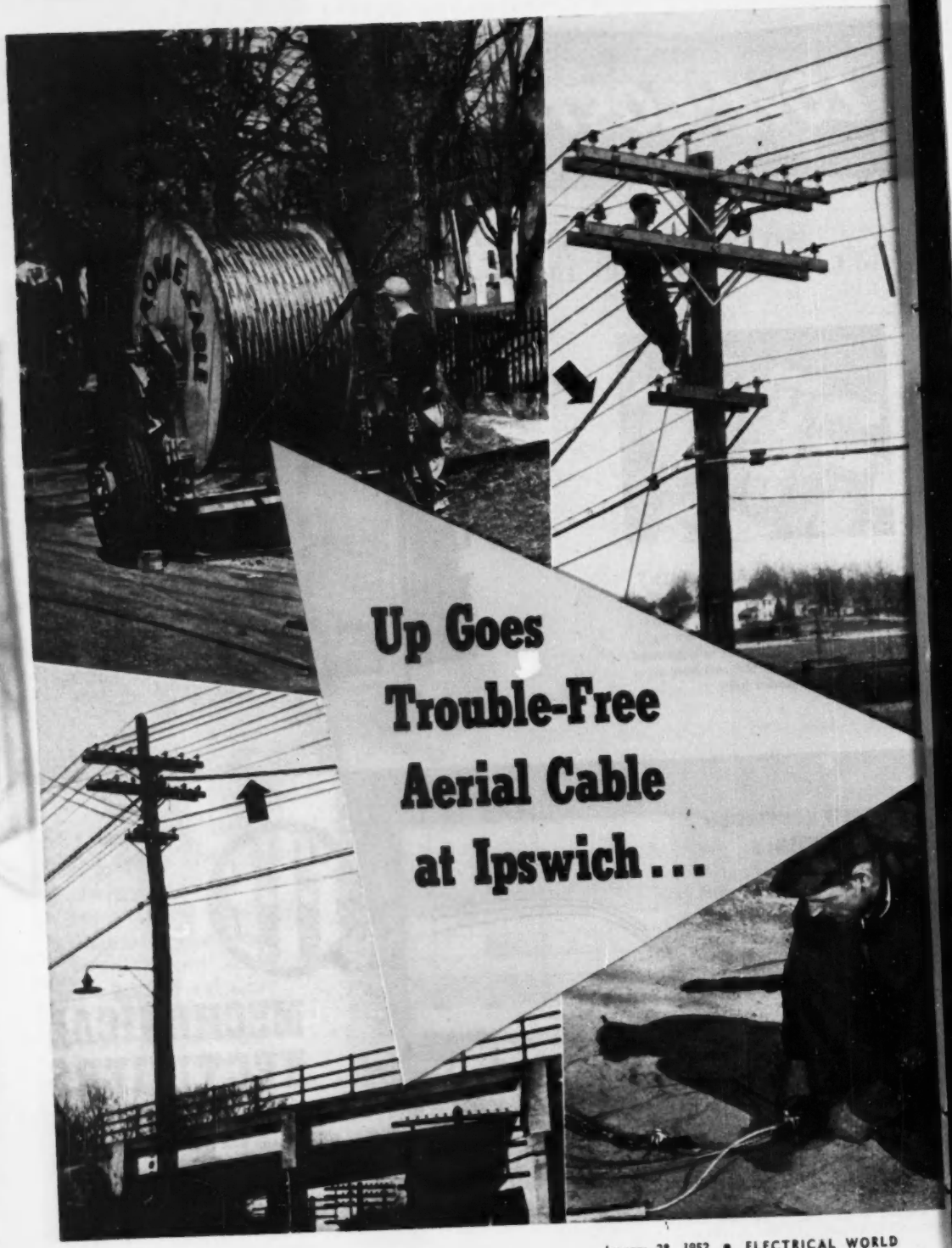
MECHANICAL RECTIFIERS

I-T-E CIRCUIT BREAKER COMPANY
19TH AND HAMILTON STS., PHILA. 30, PA.

R&IE EQUIPMENT DIVISION, GREENSBURG, PA.

CANADIAN MFG. AND SALES:
EASTERN POWER DEVICES, LTD., TORONTO

EXPORT SALES:
PHILIPS EXPORT CORP., NEW YORK, N. Y.


Up Goes
Trouble-Free
Aerial Cable
at Ipswich...

Typical RoZone Applications:

Multi-Conductor RoZone-RoPrene Power Cable—3000 Volts

Single Conductor RoZone-RoPrene Power Cable, Ungrounded Neutral—8000 Volts

RoZone-RoPrene Station Control Cable—600 Volts

RoZone-RoPrene Series Street Lighting Cable—2001 Volts and up

Rome RoZone®

Accepted by leading industrials and utilities. Approved by Civil Aeronautics Administration under Specification L-824 for airport lighting and control circuits.

The Town of Ipswich, Massachusetts recently extended its primary distribution facilities.

By selecting a specially designed three conductor pre-assembled aerial cable insulated with Rome RoZone for this job, Ipswich has assured itself of years of trouble-free service. For, no insulation has a better record. Its high dielectric and impulse strength, combined with superior resistance to corona and ozone cutting are properties which make RoZone a *premium insulation.*

Equally important, RoZone is unusually resistant to water. Its electrical properties remain unaffected by long-time burial in earth or exposure to atmosphere. It has remarkable stability for any installation where long-time dependability is paramount.

And, RoZone maintains these desirable features for years and years. Its inherent resistance to aging, heat, ozone and moisture makes it the *first choice* for aerial or underground services, 600 volts and higher. RoZone insulation is highly recommended for power cables, supervisory control and signal cables, street lighting cables, as well as general purpose wiring. *You will save by specifying Rome RoZone.* For further information use coupon below.

Copper wire mill products are a Controlled Material under N.P.A. Controlled Materials Plan. USE YOUR CMP ALLOTMENT.

It Costs Less To Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE CORPORATION, Dept. EW-1, Rome, N. Y.
Please send copy of new Rome Power and Control Cable Catalog.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

Let it rain - Let it pour - High Moisture

This is typical of the experiences of RILEY "50" pulverizer users

"The mills and feeders are performing in a very satisfactory manner. We had a twenty-four hour rain and the coal was so wet, water ran back on the belts to the bunkers. We had considerable trouble with some of our mills, the Riley's didn't seem to notice there was anything different about the coal. The test you ran here may not have been conclusive but after what we went through I believe you can quit thinking about moisture. It seems to have no effect upon your equipment."

An unsolicited letter from a large Midwest Public Utility

TRADE MARK Rx REGISTERED

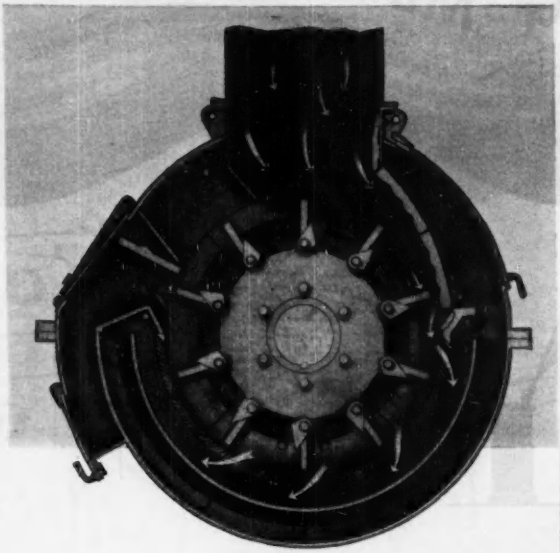
RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston Cincinnati · New York Charlotte · Philadelphia Atlanta Denver · Washington New Orleans Salt Lake City · Buffalo St. Louis Los Angeles · Pittsburgh Kansas City Portland · Cleveland St. Paul Seattle · Detroit Tulsa · Chicago Houston

BOILERS · PULVERIZERS · BURNERS · STOKERS · SUPERHEATERS · FLUE GAS SCRUBBERS

makes no difference to RILEY "50" Pulverizers



Crusher-Dryer Section

The crusher-dryer section, the first stage of the new Riley "50" pulverizer evaporates all free moisture in the coal if adequate primary air temperatures are provided so that moisture has no effect upon capacity or power consumption.

The crusher-dryer section not only dries the coal but it also rejects all foreign materials and crushes the coal to a fine granular state—at least 40% will pass a 50-mesh screen. This section also eliminates possibility of damage to the pulverizer by foreign materials as no material larger than ¼" can enter the final pulverizing stage.

Parts faced with tungsten carbides

To minimize maintenance and to assure long periods of continuous operation with sustained fineness, pulverizing elements are faced with tungsten carbide. A six-ton per hour Riley pulverizer equipped with tungsten carbide parts in September 1948 has pulverized over 80,000 tons of coal with no falling off of fineness and with but slight wear of tungsten carbide facing. See illustration of new and used parts at right. The use of tungsten carbide has greatly reduced maintenance material costs and tremendously reduced maintenance labor costs.

Riley "50" Pulverizers give you all these other significant advantages . . . .

- Quiet vibrationless operation
- Explosion proof
- Flexibility—wide load range
- Ability to carry extremely low loads
- Low power consumption
- Ease of regulation
- Small space required
- Minimum foundation cost
- Parts easily renewed
- Can be operated without coal feed
- Ease of ignition
- Low lubrication cost
- No worms or gears—Just two bearings
- High primary air temperatures

The Riley "50" pulverizer is the latest development in the coal pulverizing feed. It will pay you to thoroughly investigate this significant pulverizer development when considering additional coal pulverizing equipment.

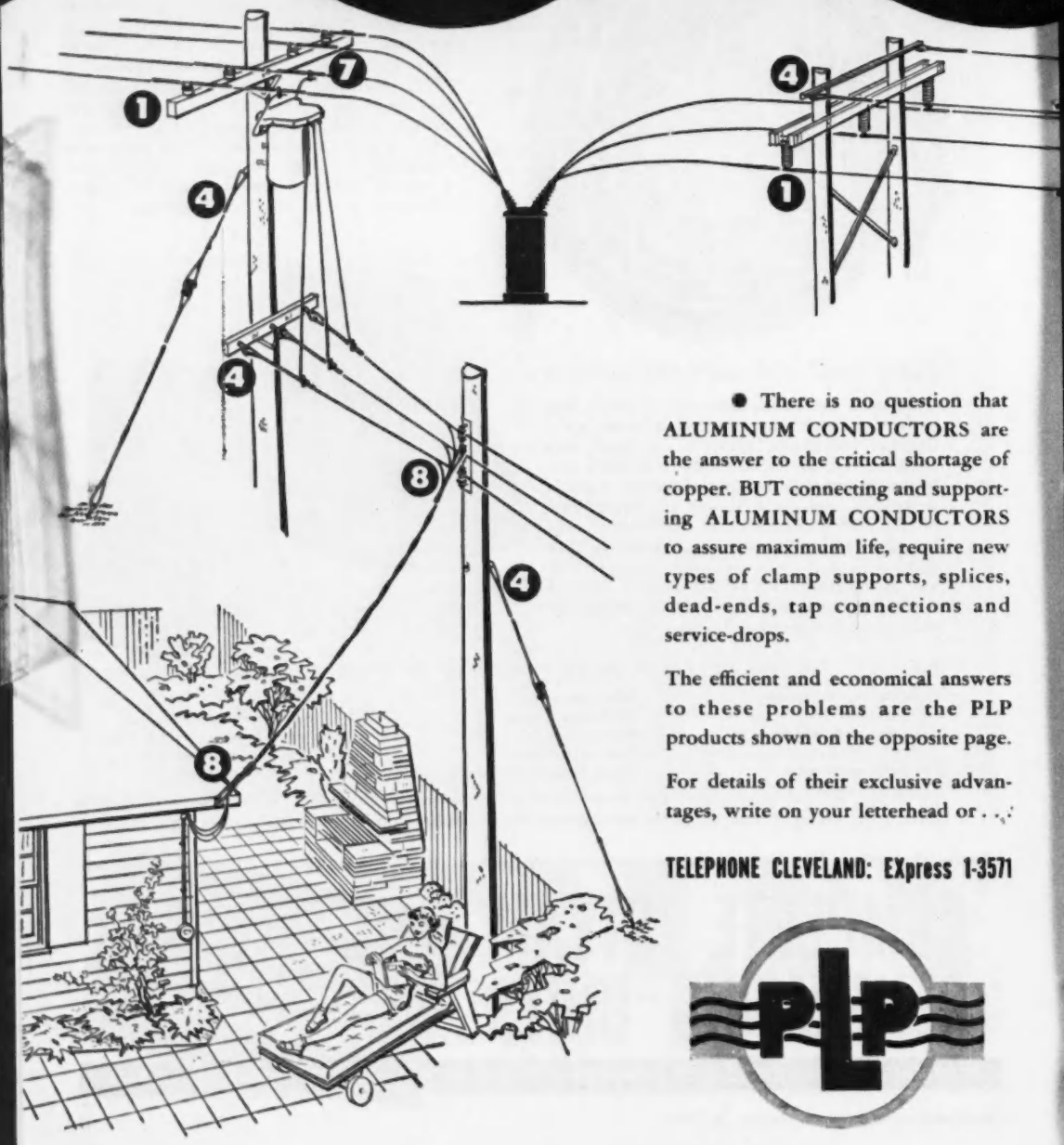
A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

"Preformed" MEANS SAVINGS



● There is no question that ALUMINUM CONDUCTORS are the answer to the critical shortage of copper. BUT connecting and supporting ALUMINUM CONDUCTORS to assure maximum life, require new types of clamp supports, splices, dead-ends, tap connections and service-drops.

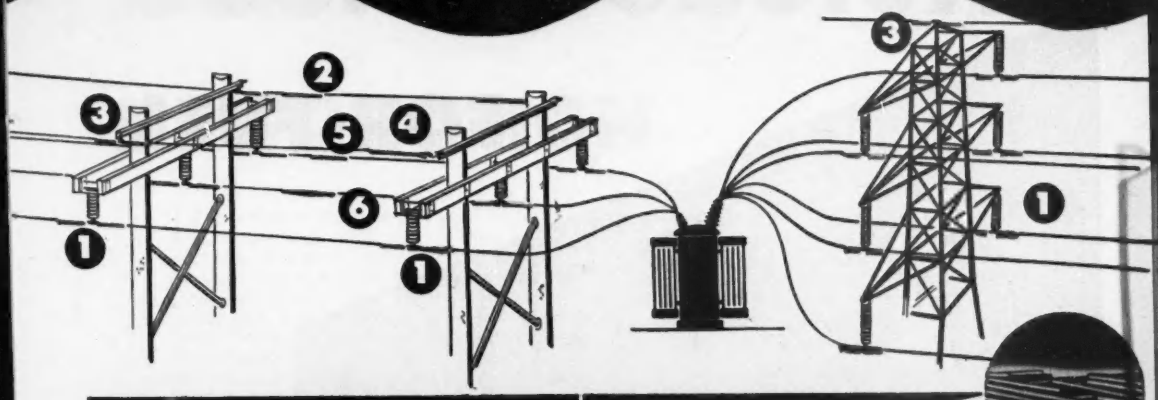
The efficient and economical answers to these problems are the PLP products shown on the opposite page.

For details of their exclusive advantages, write on your letterhead or . . .

TELEPHONE CLEVELAND: EXpress 1-3571

PLP

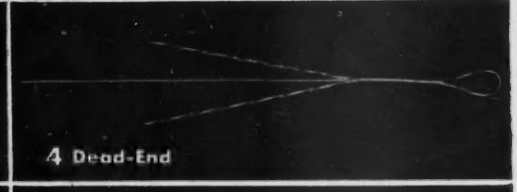
ALL ALONG THE LINE . . . . .

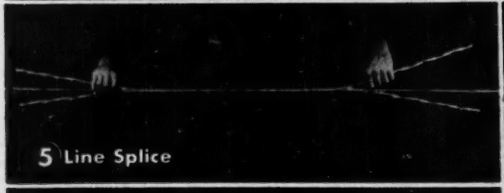


1 Support Armor

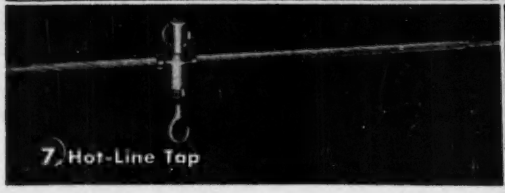
2 Repair Armor

3 Strand Armor


4 Dead-End


5 Line Splice

6 Hot-Splice Shunt


7 Hot-Line Tap

8 Service Drop Dead-End

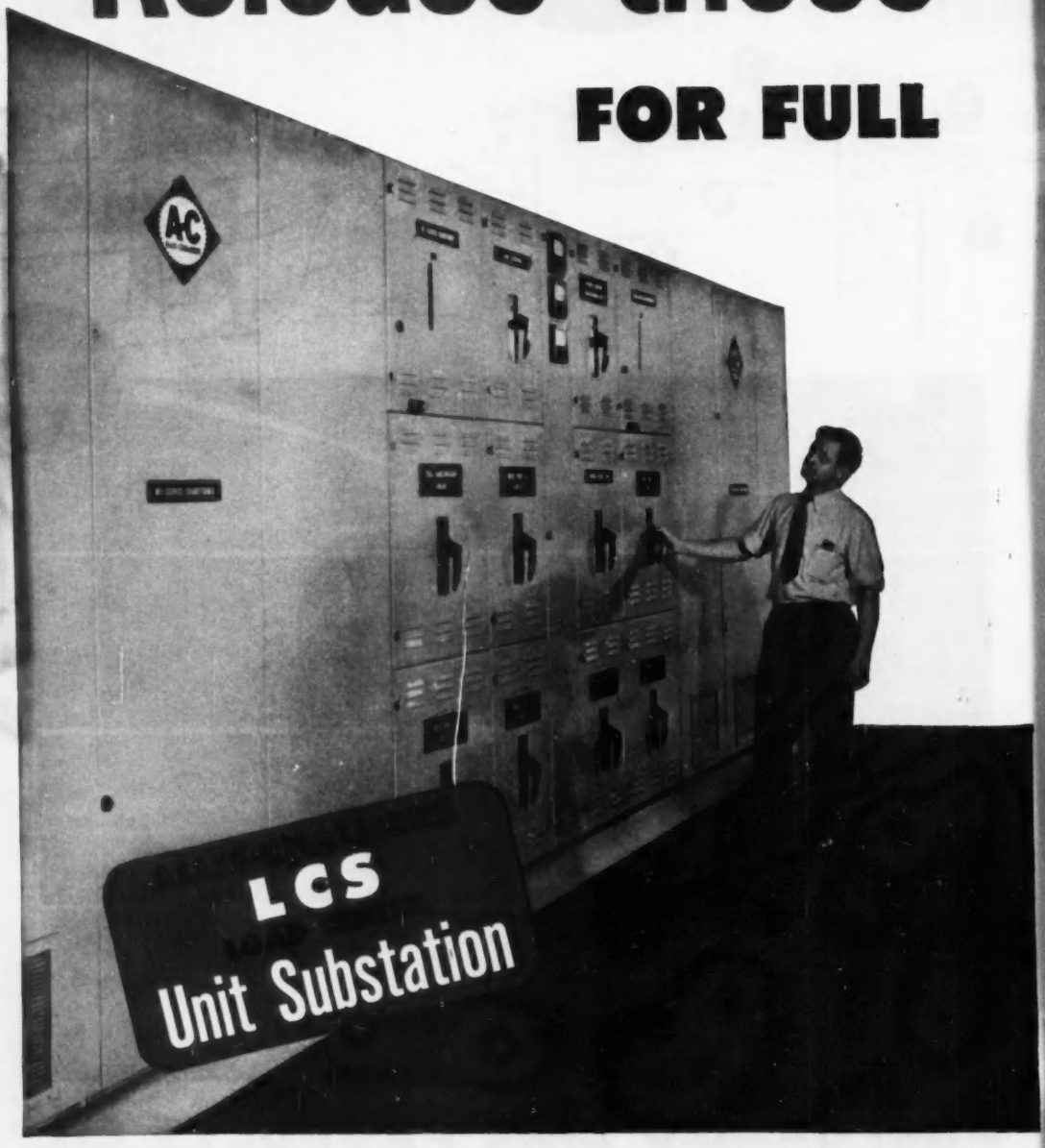
PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE CLEVELAND 3, OHIO

ALLIS-CHALMERS

Release these

FOR FULL



UNIT SUBSTATIONS

Men

PRODUCTION

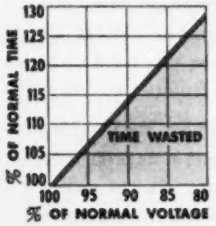
HOW MANY WORKERS in your plant are tied to low producing machines . . . turning out less work than they should because undervoltage cuts machine output? And how many more are slowed down on benchwork, layout and inspection because undervoltage pulls illumination below adequate levels? Even properly designed distribution systems may no longer be sufficient because of new machinery that has been added and production schedules that have been stepped up.

When your plant operates at 10% undervoltage, torque available from squirrel-cage motors driving production machines is 19% below normal . . . infra-red bulbs take nearly 20% longer to deliver rated amounts of heat . . . workers take up to 25% longer to do their jobs and accident rates are high because illumination levels drop as much as 30%.

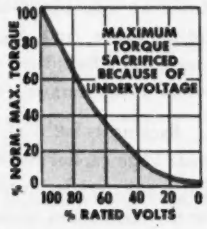
Recruit manpower from within your own plant by getting rid of low illumination levels that rob worker efficiency. Recover production time wasted by slow producing machines. Install Allis-Chalmers LCS Unit Substations at load centers and eliminate excessive line drop by shortening low voltage cables.

You can count on the cooperation of experienced Allis-Chalmers substation engineers in working out your distribution system. Allis-Chalmers LCS Load Center Unit Substations are neat, compact, easy to install and provide protection to personnel. Get in touch with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletins 11B6285A, 11B6325B, and 11B6895. A-3373

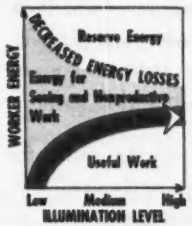
HOW UNDERVOLTAGE WASTES MAN-HOURS . . . CUTS PRODUCTION



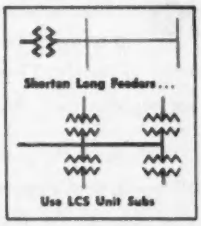
TIME IS WASTED when undervoltage is distributed to infra-red bulbs and other heating devices. It takes longer to deliver the same amount of heat . . . longer to do a given job. In one plant, for instance, drying time for black-painted sheet steel was increased from 11 minutes to 18 minutes by a 10% reduction in voltage.



JOBS TAKE LONGER because torque and horsepower drop when voltage drops. Less torque means lighter cuts on lathes, shapers, drill presses, and other machine tools. Motors overheat on undervoltage, burn out faster. More time must be spent on each job. More overhead . . . more man-hours have to be figured into every job.



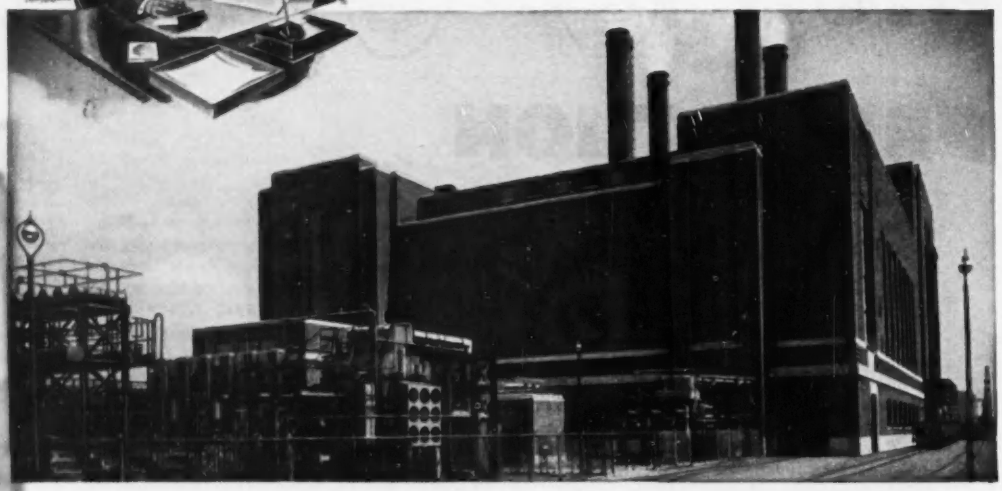
WORKERS SEE BETTER, produce more when full voltage is maintained. Illumination was increased from 6 to 16 ft. candles (equal to an increase from 83% to full voltage) . . . resulting in a 9% increase in production, 20% decrease in accidents. In another case, production increased 25% with improved illumination.



A MAJOR CAUSE of undervoltage is the voltage drop in secondary feeders. Long lines of heavy copper carrying power at low voltage may prove inadequate as production schedules are stepped-up and new machines added. Install Allis-Chalmers LCS Substations at load centers to reduce voltage drop and increase production.

ALLIS-CHALMERS

"My bet's on Bituminous-



—the kind that is mined on the B&O!"

Take a tip from executives who think in terms of fuel economy and dependability of supply. These men design their plants for the efficient coals mined in B&O territory.

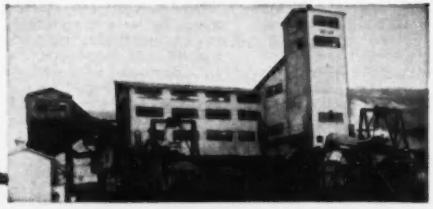
These coals, available in wide variety for all needs, lend themselves to mechanized, low-cost mining. As they are located close to America's industrial heart, transportation costs are moderate. And because their sources are *known* and *definite*, they can be depended upon —*even during wartime*—for centuries to come.

Backing its faith in Bituminous, the B&O has made large capital investments in its properties. The result will be even more efficient service for the Bituminous industry and its customers.

Ask Our Man!

BITUMINOUS COALS FOR EVERY PURPOSE

from modern mines like this—→



BALTIMORE & OHIO RAILROAD

Constantly *doing things* **—better!**

This *NEW INSTRUMENT* Offers Greater Convenience in Field Use

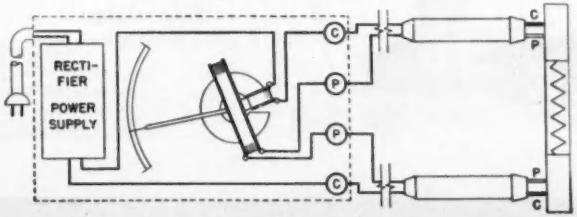
MEGGER® LOW RESISTANCE OHMMETER

This most recent addition to the Megger family of electrical resistance measuring instruments is a general purpose type with self-contained power supply. The set is available in two models, both having the same ranges of 0 to 1000 and 0 to 10,000 microhms. Model 1B carries batteries and Model 1R has a built-in rectifier which plugs into any ordinary lighting circuit outlet. Ample space is provided for the storage of all necessary leads and prods in a compartment of the same case.

The complete unit, with either battery or rectifier weighs only about 19 pounds. It is, therefore, easily portable and convenient to use in the field.

Write for Bulletin 24-46 EW which describes these new instruments completely.

Schematic diagram of electrical connections for the Megger Low Resistance Ohmmeter



JAMES G. BIDDLE CO.

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

BIDDLE *Instrument News*

"CABLE-FAULT LOCATING PRACTICES IN PHILADELPHIA"

That is the title of an article which appeared in a recent issue of Electric Light and Power Magazine. It was written by R. S. Diggs, Assistant Superintendent, Service Maintenance Section, Philadelphia Division, Electric Transmission and Distribution Department of the Philadelphia Electric Company.

Mr. Diggs discusses the three methods of locating cable faults used on his company's underground power systems, the a-c method, the thyratron, and the impulse method.

We have obtained a limited supply of these reprints and will be glad to supply them to interested individuals so long as the supply lasts. Check Bulletin 65 P1 EW on the coupon below.

USERS FIND BIDDLE TTR SETS INDISPENSABLE

There have been a lot of mighty fine things said about our Transformer Turn Ratio Test Set in the two years we have been producing them. But nothing we have heard compares with the comments we have been hearing lately.

Since the announcement of Model 3 we have had requests for modification of several earlier models. It is gratifying to receive comments like:

"We hope that the change-over will not require too much time as this instrument is in daily use on our test floor." and:

"Our instrument is used constantly by the testing department and is such a timesaver that we want to have it back in service as soon as possible."

We would like to quote all the things that have been said about this unique instrument but space does not permit. We urge those who have not investigated the TTR Set to do so by writing for Bulletin 55 EW which describes it in full.

James G. Biddle Co.
1316 Arch St., Philadelphia 7, Pa.

Gentlemen:
Please send me items checked:

☐ 24-46 EW ☐ 65 P1 EW ☐ 55 EW

NAME

JOB FUNCTION

COMPANY

ADDRESS

POTOMAC RIVER GENERATING STATION
Potomac Electric Power Company

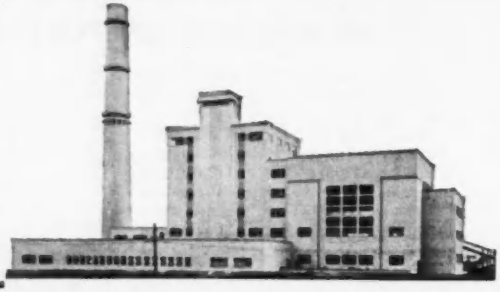
In November 1951 the Federal Power Commission released a report entitled "Steam-Electric Plant Construction Cost and Annual Production Expenses for 1950."

Among other interesting and significant data were the "Average Btu per Kilowatt-hour Net Generation" of 264 power stations reporting from all sections of the country. Seven of the ten steam-electric stations having the *lowest* annual heat rates — as revealed by the report — are pictured on these pages.

All of the steam generating equipment in these seven stations was designed and built by Combustion Engineering — Superheater, Inc.

B-546

7 of



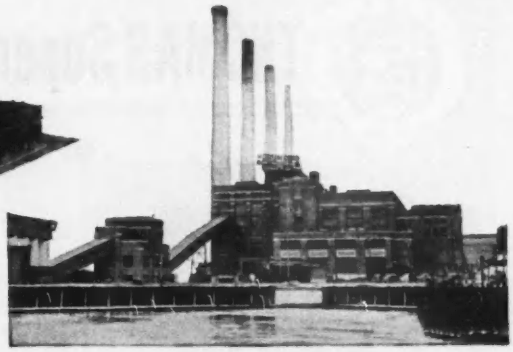
RUSSELL STATION
Rochester Gas & Electric Corporation

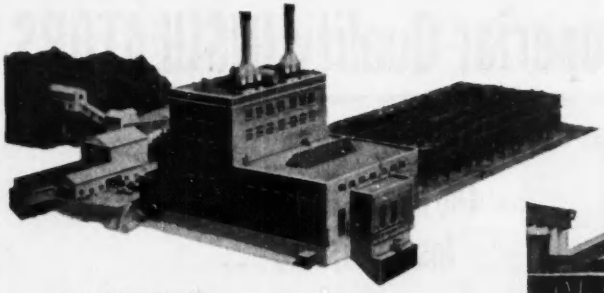
PORT JEFFERSON STATION
Long Island Lighting Company

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS, ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

PORT WASHINGTON STATION
Wisconsin Electric Power Company

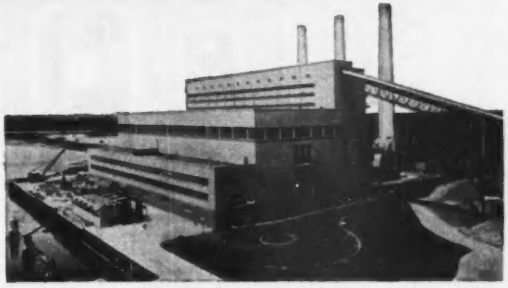




DAN RIVER STATION
Duke Power Company

the top 10

O. H. HUTCHINGS STATION
The Dayton Power and Light Company



SEWAREN GENERATING STATION
Public Service Electric and Gas Company

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

C-E

THOMAS Superior-Quality INSULATORS .

Fig. 1—Superior-Quality Pin-Type Insulators

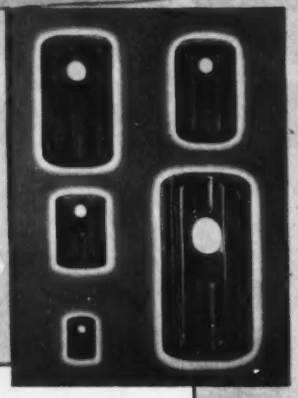


Fig. 2—Guy-Strain Insulators

Fig. 3—Distribution Hardware

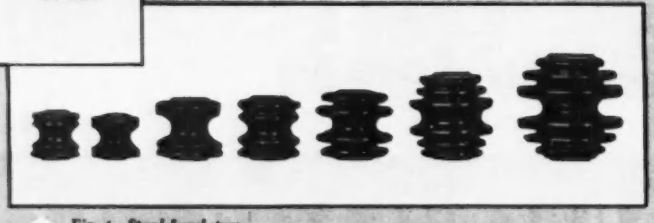


Fig. 4—Spool Insulators

the ingredients of Superior-Quality Insulators are . . .

Proper Designing
Precision Manufacturing
PROOF OF PERFORMANCE

Since the beginning of the Electrical Industry, Thomas has been supplying porcelain for the most difficult insulation problems . . . whether high-voltage transmission or low-voltage distribution. And despite these unusual times, when quality and skilled workmanship could be sacrificed, you can specify Thomas Insulators with full confidence that quality and value cannot be surpassed.

Specifically, our Distribution Porcelain and hardware are backed by 79 YEARS of ceramic experience and knowledge. Consequently, THOMAS porcelain is the standard of comparison for discriminating engineers throughout the Electrical Industry.

All THOMAS Insulators have been constantly improved. Typical THOMAS advancement is our complete line of *patented . . .

Quiet-Type Insulators

*Patent No. 2134387

ENGINEERS, MANUFACTURERS AND DESIGNERS SINCE 1873

. . . . Standards of DISTRIBUTION QUALITY

Quiet-Type Insulators

Record acceptance by the Industry proves these radio noise-free pin-types (Figures 5, 6, 7 and 8) are setting tomorrow's standards. It's not surprising . . . for they eliminate all insulator radio-interference.

Thomas engineers pioneered and were first to develop the under-glaze metallic oxide coating—applied to the areas indicated by red in Figure 7. The result is a barely discernible coating—contamination free because it's under the glaze. Sprayed on before firing (Figure 6), it becomes a permanent part of the porcelain—can't come off and guarantees positive noise-free operation without sacrificing any insulating qualities.

Line and laboratory tests prove the superiority of these insulators over conventional types. As you see on the graph (Figure 8), it takes four times as much voltage to produce noise-making microvolts with the Thomas "Quiet-Type" design.

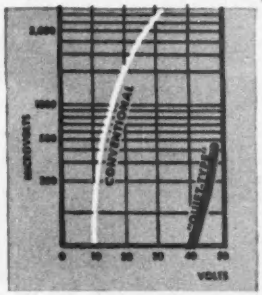
In terms of customer goodwill your Thomas "Q-T" Insulators earn their slight additional cost many times over.

Fig. 5—Typical "Quiet-Type" Insulators

Fig. 6—Spraying under-glaze metallic oxide coating.

Fig. 7—

Fig. 8—



SPECIFY THOMAS INSULATORS—THE BEST BY LINE TEST

— Since 1873 —

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, preformed armor rods and so on.

The R. Thomas and Sons Co.

LISBON, OHIO

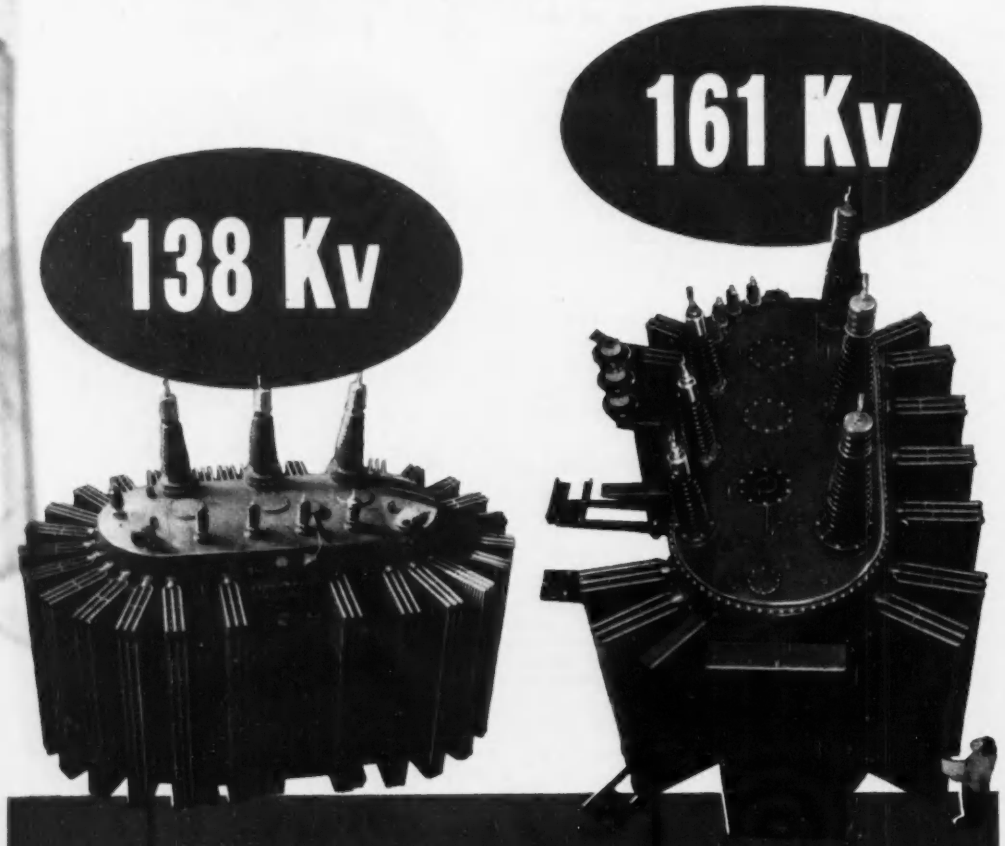
NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Hann Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* E. J. Sullivan & Company, *Boston* • Tafel Electric & Supply Co., *Louisville* • Walter E. Thompson, *Birmingham* • E. E. Tarbell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*

High Voltage POWER

by

Pennsylvania



37,500/50,000 Kva. 3 Phase, 60 Cycles, 132,000 Grd. Y—24,000Y/13,860 volts—6900Δ volts. Self-cooled/forced-air-cooled. Inert gas pressure system of oil preservation.

30,000 Kva. 3 Phase, 60 Cycles, 154,000 Grd. Y—115,000 Grd. Y—12,470Δ volts. Self-cooled. Inert gas-oil seal system of oil preservation.

TRANSFORMERS

Typical of the many higher voltage power transformers now under construction in the Pennsylvania plant are the recently-completed units pictured here. They represent single and three-phase transformers of core-form and shell-form construction.

Each transformer is designed and manufactured with the extra care and precision which will pay dividends to the user in the form of outstanding reliability and low operating costs.

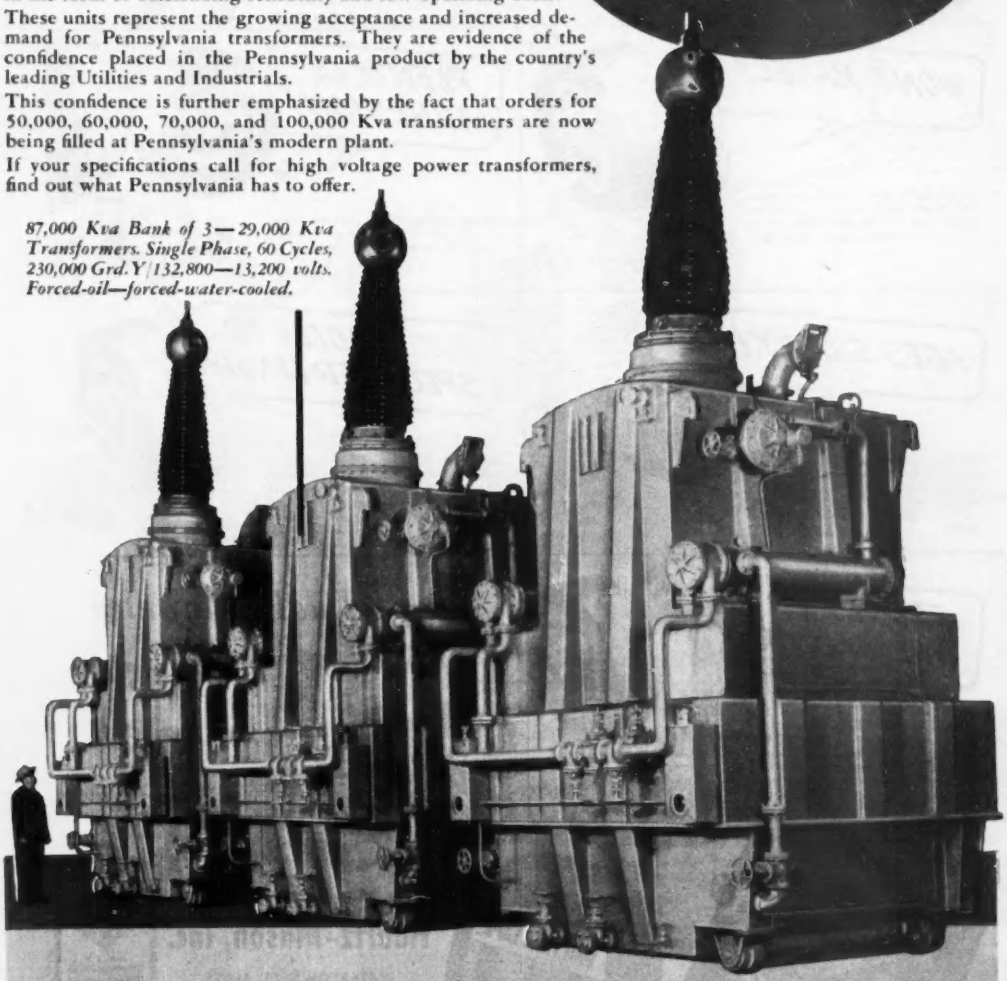
These units represent the growing acceptance and increased demand for Pennsylvania transformers. They are evidence of the confidence placed in the Pennsylvania product by the country's leading Utilities and Industrials.

This confidence is further emphasized by the fact that orders for 50,000, 60,000, 70,000, and 100,000 Kva transformers are now being filled at Pennsylvania's modern plant.

If your specifications call for high voltage power transformers, find out what Pennsylvania has to offer.

230 Kv

87,000 Kva Bank of 3—29,000 Kva Transformers. Single Phase, 60 Cycles, 230,000 Grd. Y/132,800—13,200 volts. Forced-oil—forced-water-cooled.



Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PENNA. • *Greater Pittsburgh District*

PARAMOUNT FRICTION TAPE by Haartz-Mason

1

Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.

2

In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.

3

Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against ravelling.

4

Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.

5

Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212° F. for 16 hours. Thus you get a guarantee of maximum aging ability.

6

Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus . . . guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.

7

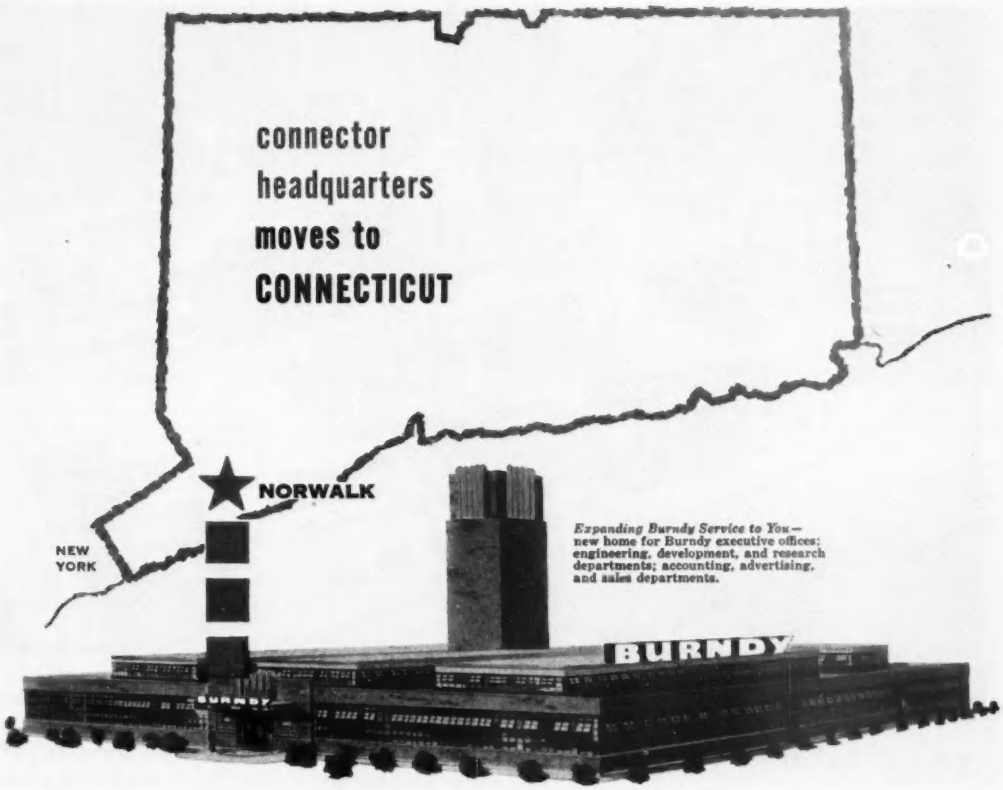
To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.

Manufactured by

Haartz-Mason, Inc.

WATERTOWN 72, MASS.

Emblem of Industrial Character
Rice Leaders of the North Association



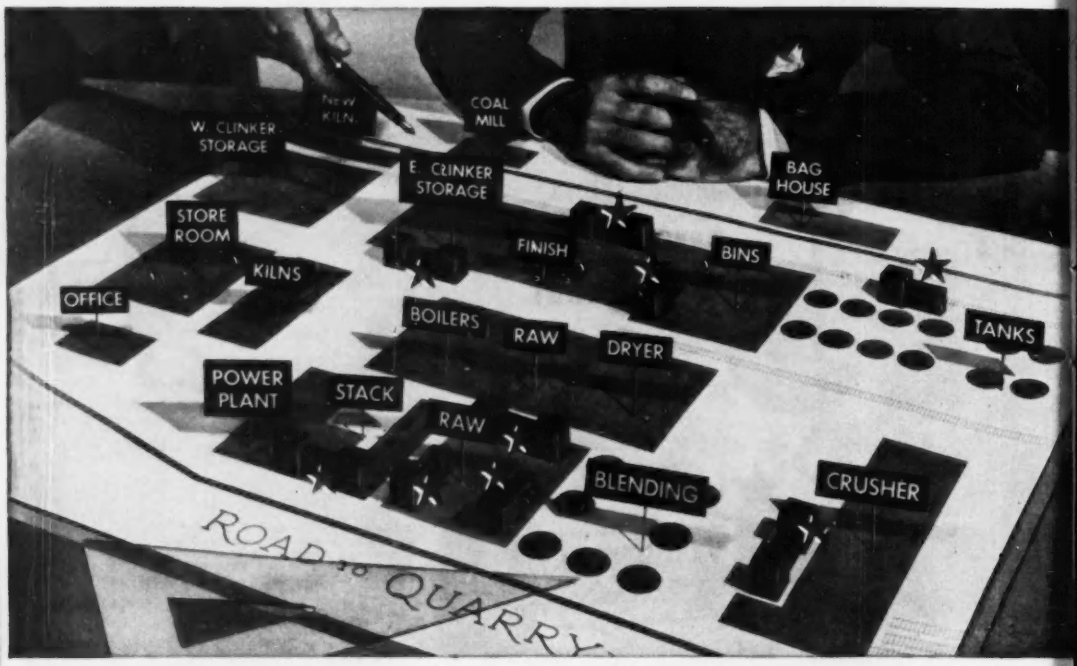
Burndy's new home in Norwalk, Connecticut is the latest expansion in our 28-year history of steady progress—from a small beginning to our present 5 modern manufacturing plants in New York, California and Canada; a warehouse in Stamford, Connecticut; and 34 sales (meaning *service*) agencies throughout the country.

Burndy's consistent growth reflects the consistently superior performance of Burndy connectors... in joining, terminating, clamping, and grounding every variety of wire, cable, tube or bar which carries electricity.

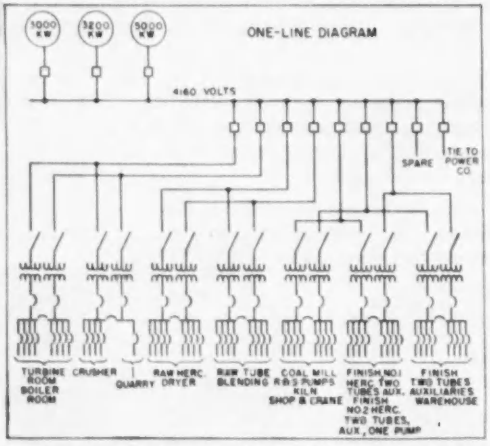
BURNDY

BURNDY ENGINEERING COMPANY • NORWALK, CONNECTICUT

Dewey Portland Cement Co. solves



Modernized System gives additional capacity



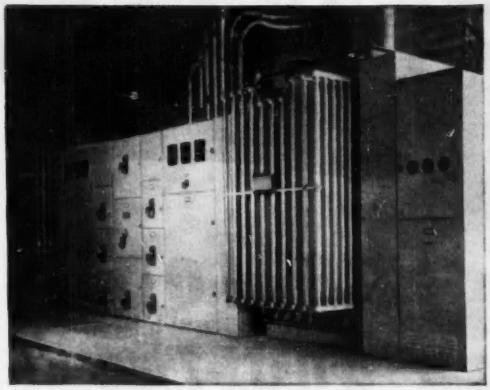
One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.

For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

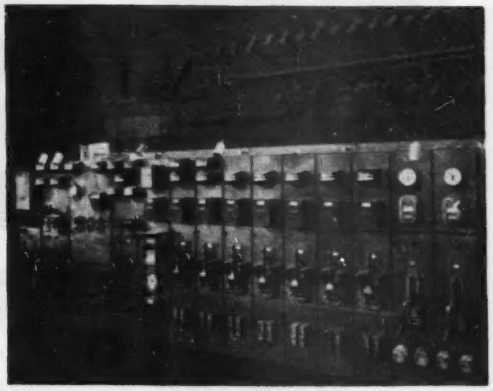
Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.

LOAD CENTER
POWER DISTRIBUTION SYSTEMS

a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.



Old switchboard with exposed switches and conductors threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

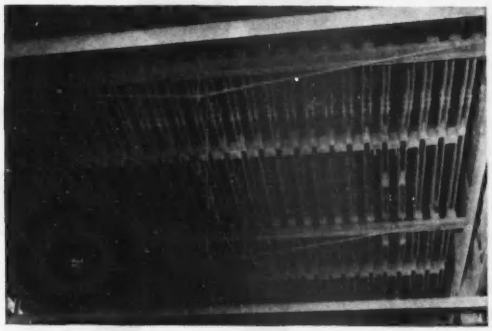
Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

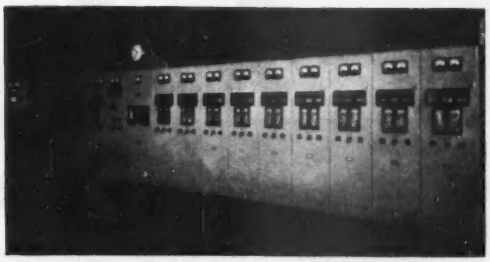
G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



¼" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.



New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL ELECTRIC

321-81

Nicopress

The Tool and the Sleeve

that are made to work together

together they make the perfect splice

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—H. SLATER CO., LTD., HAMILTON, ONT., CANADA

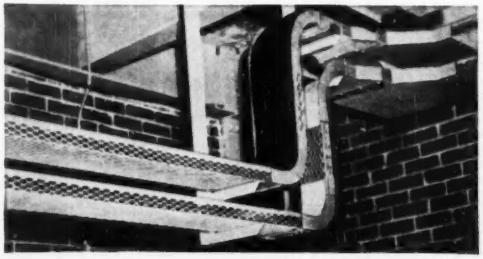
Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

In This
NATIONAL EMERGENCY

Save MATERIAL
Save MAN-HOURS
Save COSTS

with the new system of
COPE CABLE TROUGHS



Today's State of Emergency requires everyone to make savings wherever he can. By using Cope Cable Trough, you save in all possible ways . . . *material, man hours* and *costs.*

In addition, there is no better system on the market for the support of Cable and Instrument Tubing.

MODERN, STREAMLINED DESIGN—Conserves material and at the same time makes the troughs simple and versatile.

MAN HOURS CUT—Engineering costs are slashed when Design Engineers can order a complete installation from the Cope Cable Trough catalog. Installation costs are cut to the bone with simplified assembly.

SAVINGS UP TO 66%—Users say Cope Trough saves them real money (one large utility stating as high as 66%) over other methods.

ENGINEERING HELP—Where unusual problems in your installation perplex you, instead of devoting your time to the solution, request our Engineering Staff to solve them for you. Every day Cope solves such problems for its customers.

If you have not already done so, write today for the new bulletin on Cope Cable Trough.

T.J. Cope INC.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA

A GIANT STRIDE FORWARD *in* ELECTRICAL WIRIN

GENERAL CABLE

GENERAL CABLE

GENERAL CABLE

SAFETY®

MINERAL m.i. INSULATED

WIRING* SYSTEM

PYROTENAX

UNI-DRAWN, SELF-PROTECTED WIRING with DRY-MINERAL INSULATION OFFERS AMERICA its FIRST PERMANENT WIRING SYSTEM!

To every man responsible for the creation of an electrical installation intended to endure, Safety m.i. Wiring System, a General Cable exclusive, is a product to be investigated . . . thoroughly . . . and immediately. Descriptive literature is available. We suggest you contact the nearest General Cable office, or write us.

CHEMICAL INDUSTRIES
find this sealed wiring most economical. It stands up under their difficult conditions.

COLD STORAGE
and other plants beset with moisture or condensation are glad to substitute this for conduit wiring.

MACHINE TOOL WIRING
becomes less troublesome with a semi-flexible, space-saving wire that is absolutely oil proof.

POWER PLANTS
can safely install Safety m.i. Power Cables and Control Cables where high temperatures prevail.

MARINE
demands for fire safety, self-contained weather-proofness, and non-deterioration are well served.

SAFETY m.i. WIRING* SYSTEM provides advantages never before achieved!

Will Outlast the Structure in Which It Is Installed!

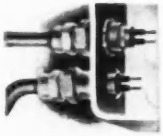
Immune to age-deterioration due to its "all mineral" construction. Unaffected by high temperatures resulting from current overloads, either accidentally imposed or to meet emergency increased power demands.

Completely Moisture-Proof!

Simple fittings permanently seal both ends of each run of wiring. No possible entrance for moisture. Normal concern over this hazard is, thereby, completely eliminated.

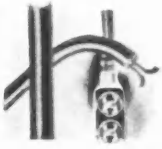
One-Step Installation!

No additional mechanical protection required. Safety m.i. Wiring is its own conduit, installed in one operation with standard switch and junction boxes. Smaller diameter saves space.



Rigid yet flexible!

Thumb pressure bending is sufficient, in ordinary sizes, to fashion orderly wall patterns—or to conform wiring to any contour. Once formed, it rigidly stays put indefinitely when fastened with standard clamps or straps.



No Vapor Passage!

Completely filled with compacted mineral insulation. No need for specially installed seals in the cable run normally required to prevent passage of combustible gases through a wiring system.

No Heat Deterioration!

The mineral insulation of Safety m.i. is physically stable up to 2800°C., thereby assuring against deterioration by heat even beyond the melting point of the copper sheath.

*Exclusively a General Cable Product

"More Power to You"

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.
SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

WHICH OF THESE SERVICES WILL HELP YOU?

At your fingertips, through EBASCO, are engineers, constructors, business consultants—specialists who can help solve your most troublesome business problem quickly and economically. Solve it, moreover, without adding permanently to your payroll . . . without disturbing existing company relationships.

Need help with financing? During the past few years EBASCO has advised on the raising of over two billion dollars in new capital. Is industrial relations your current business headache? EBASCO has assisted in planning and developing many outstanding industrial relations programs. EBASCO has devised efficient systems and methods; designed and built over one billion dollars worth of new plants. EBASCO has developed insurance, pension and safety programs . . . made appraisals . . . sales and marketing studies . . . solved production and plant layout problems and performed many similar services for business and industry throughout the world.

EBASCO will do all or any part of a job, for companies large or small. To find out *exactly* how we can serve you best, write for your copy of "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6.

EBASCO
ENGINEERS CONSTRUCTORS BUSINESS CONSULTANTS

Appraisal
Budget
Business Studies
Consulting Engineering
Design & Construction
Financial
Industrial Relations
Inspection & Expediting
Insurance, Pensions & Safety
Office Modernization
Purchasing
Rates & Pricing
Research
Sales & Marketing
Systems & Methods
Taxes
Traffic
Washington Office

EBASCO TEAMWORK GETS THINGS DONE ANYWHERE IN THE WORLD

EBASCO SERVICES
INCORPORATED
NEW YORK • CHICAGO • WASHINGTON, D. C.

From Northern Canada to the Tropics

Kyle OCR's are OK

They give you dependable operation in any kind of weather

▼ Ambient temperatures are no problem to Kyle® Oil Circuit Reclosers. They are as dependable at extremely low temperatures as at normal temperatures. Installation records show that thousands of Kyle reclosers are regularly operating at extreme temperatures all over the world.

Here's just one example: One of the large users of Kyle reclosers is a power company in Northern Canada. Here the long clear summer days get pretty hot. And on long winter nights the mercury may drop down to 50 below.

In winter, deep snowdrifts block roads for weeks at a time. A blown fuse could mean a long blackout. But with Kyle reclosers, there are a minimum of power interruptions. Performance is excellent the year around. Customers have less trouble, and Kyle reclosers don't seem to know whether it's hot or cold, judging by their unfailing, prompt, accurate operation.

Kyle reclosers lick weather problems. Eliminate service trips over ice and snowdrifts. Cut outages to a minimum. Save money on fuse link replacements. Assure accurate coordination. Ask the L-M Field Engineer for details on L-M—Kyle complete automatic protection. Or write for a copy of Bulletin CR1 to Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Kyle oil-filled equipment is now supplied with ORTO®, L-M's oxidation resistant transformer oil, inhibited to lengthen oil life.

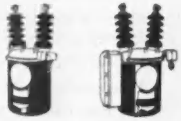
Kyle type H single-phase recloser, with all the Kyle safety features. Seven operating sequences.

Kyle type 3H — operates individually on each phase but locks out all three phases simultaneously.

Kyle type L Heavy Duty—only recloser with 4 operating curves; interrupts up to 6000 amperes.

Kyle type E recloser, with all the Kyle features. It is engineered especially for 23 kv systems.

Kyle type GS sectionalizer makes protection completely automatic—coordinates with all reclosers.



Kyle oil switches for many applications. Manually operated type G, or remote control type GR (right) for capacitor and other remote control switching.

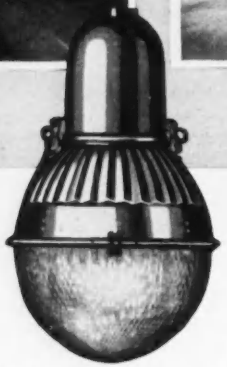
LM

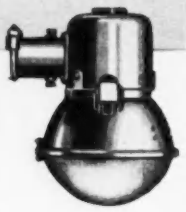
LINE MATERIAL... Kyle Reclosers

For every part of town...

L-M LUMINAIRES

make cities brighter, safer

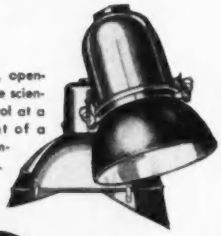




L-M Ovalite—Mercury Vapor Unit. Newly developed optical system assures effective light utilization and good distribution on the street. Mercury vapor lamp is in horizontal position, high up in the reflector to minimize glare. Takes 11,000, 15,000 or 20,000 lumen lamp. Optional magnetic arc control feature keeps arc centered.

L-M Spherolite This famous L-M unit is widely known for its high efficiency, versatility, and many other desirable features. Takes up to 20,000 lumen mercury vapor or 10,000 lumen incandescent lamps.

L-M Spherolite Jr. For better neighborhood lighting at an economical neighborhood price. Interchangeable with Spherolite metal or porcelain heads, permitting low cost installation of the Junior and economical replacement later with the larger luminaire if traffic growth warrants. Has many of the Spherolite features, offers many light distribution patterns.



L-M Directolites Efficient, open-type luminaires that provide scientifically designed light control at a cost little more than that of a radial bowl. Available in symmetric or asymmetric types.

● L-M provides complete street lighting equipment for all sizes of communities and all kinds of neighborhoods. There are incandescent or mercury vapor units for white way lighting. There are smaller units for residential and outlying sections. A wide variety of reflectors, deflectors and glassware provides complete control for every recommended IES light distribution pattern.

Also available are standards, brackets and mast arms, transformers, control and service equipment.

L-M street lighting engineers have years of experience and L-M's engineering service can provide the answer to your street lighting application problem.

WHICH OF THESE BULLETINS DO YOU WANT?

- ☐ Spherolite
- ☐ Spherolite Jr.
- ☐ Street Lighting Standards
- ☐ Directolite
- ☐ Controlite®
- ☐ Brackets, Mast Arms, Accessories
- ☐ Mercury Vapor Lighting Units
- ☐ Control Equipment
- ☐ Protective Lighting for industrial plants

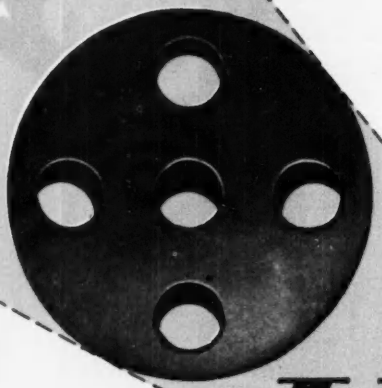
Ask the L-M Field Engineer for the information you want, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Ovalite, Spherolite, and Directolite are trademarks

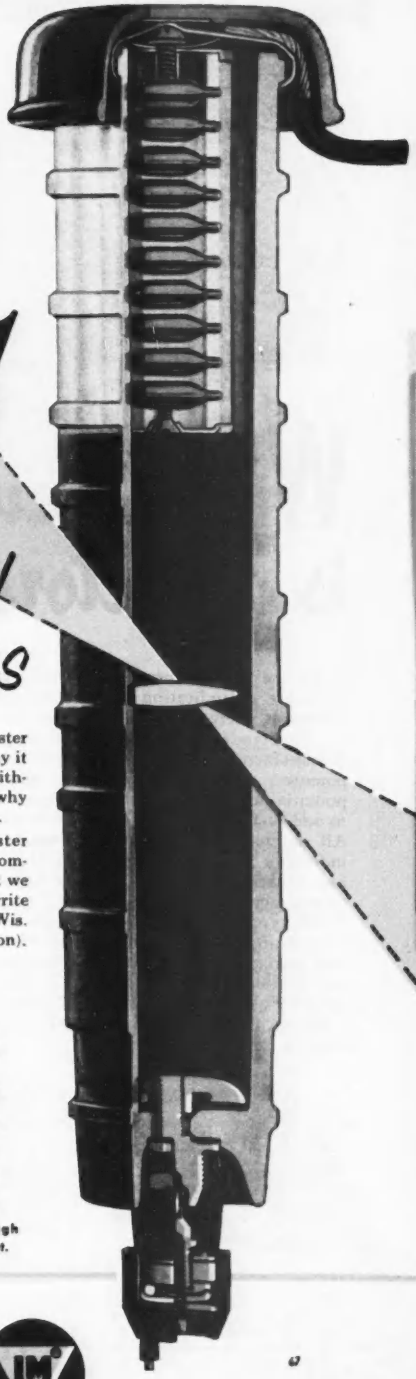
LM

LINE MATERIAL

Street Lighting



the only lightning arrester with the LENS *that gives it such high discharge capacity and unchanging characteristics*



An ingeniously designed lens electrode is placed in the valve element of *every* L-M valve type arrester. This exclusive L-M feature performs an extremely valuable function that accounts for the exceptional performance and long life of L-M arresters.

Here's why. Lightning surge current tends to "skin" down the outside of the valve element, just as 60-cycle current will flow on the skin of a conductor. This results in only a small portion of the valve element being used to handle lightning surges. Thus the surge capacity of what might be a good arrester is materially lowered—the valve element will fail in time due to the excessive concentration of current on the outer skin.

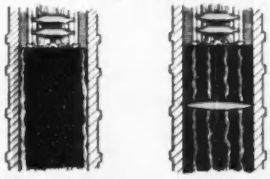
The L-M lens electrode completely counteracts lightning surge current "skin effect." The full cross-section of the valve element is available for extremely high surges—considerably in excess of 65,000 amperes.

The lens does the job. It distributes the surge evenly throughout the valve element—doesn't allow it to concentrate in any one path and thus clinker the element.

That's one reason why an L-M arrester can take more and heavier surges—why it maintains its high discharge capacity without change, for years and years . . . why its rate of failure is so gratifyingly low.

Get the whole story on L-M arrester performance, including some utility company records which substantiate what we say. Ask the L-M Field Engineer, or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

Here's What Happens



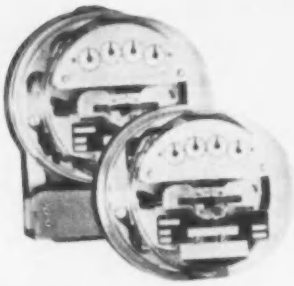
Without LENS
Surge channels down sides of element.

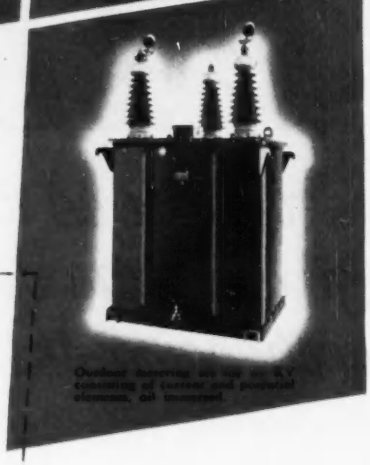
With LENS
Surge goes through the entire element.

LINE MATERIAL
Lightning Arresters

Complete Coordinated Equipment for Distribution Today

current, potential and metering transformers





When accuracy is a factor

In the field of measurement for precision metering, operation of indicating instruments, relays and control apparatus, there is no substitute for accuracy.

The Standard Transformer Company has designed and is manufacturing a complete line of accurate current and potential transformers for every application... current, potential and metering transformers for any voltage up to and including 72 KV, and at any specified frequency. All thermal and mechanical ratings in accordance with industry's requirements and standards for each specific use. All standards set by ASA and EEI-NEMA in respect to accuracy are met.

Many prominent manufacturers of switchgear and control apparatus are regular users of STANDARD current and potential transformers. Our production facilities are flexible and engineering skill versatile enough to produce quickly transformers of special design to meet your specifications. Call in your STANDARD representative for further information.

WRITE FOR BULLETIN S-501-B

32 pages of detailed drawings, accuracy limits, ratio and phase angle curves for current, potential and metering transformers. Write for your copy today.

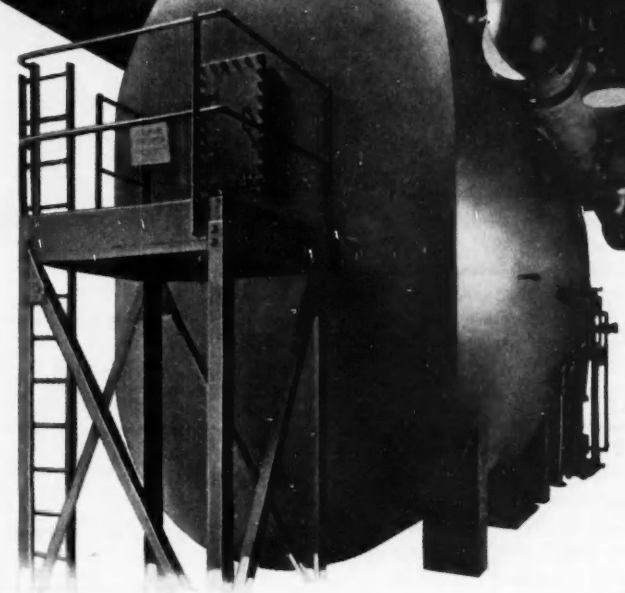
everything points to

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

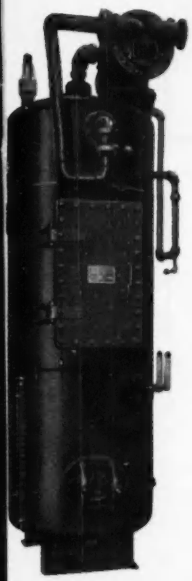
REPRESENTATIVES IN PRINCIPAL CITIES

COCHRANE MULTI-STAGE DEAERATOR



Below is shown one of two Cochrane Multi-Stage Deaerators — capacity 40,000 lb./hr., handling 100% make-up at a prominent public utility station.

At the left is shown a Cochrane Multi-Stage Deaerator, of elliptical design, installed in one of the country's most important electric generating stations. With a capacity of one million pounds per hour, it deaerates returned condensate to zero oxygen (0.005 cc. per liter) before being fed to the high pressure boilers.



COCHRANE originated and for many years has supplied the MULTI-STAGE DEAERATOR for the complete deaeration of 100% cold saturated water and for turbine condensate or other supplies where the difference in water inlet and outlet temperatures may be as small as 20° or 30° F. It is designed as two heaters in series. The top heater is of the jet type and the lower heater of the down-flow tray type. In the jet heater, the water is heated to within a few degrees of steam temperature and the bulk of the non-condensable gases are liberated. The water, with very low oxygen content, passes down to the tray heater where complete heating and deaeration takes place. The first heater acts as a direct contact vent condenser for the second heater, permitting omission of the vent condenser.

Write for a copy of Publication 3005.

COCHRANE CORPORATION, 3146 N. 17th St., PHILADELPHIA 32, PA.

In Canada: Canadian General Electric Co., Ltd., Toronto • In Mexico: Babcock & Wilcox de Mexico, S. A., Mexico City

In Europe: Recuperation Thermique & Epuration, Paris

COCHRANE

COCHRANE CORPORATION 89 YEARS OF SERVICE 1863 - 1952

PIONEERS AND LEADERS IN BOILER FEED PROCESS & INDUSTRIAL WATER CONDITIONING

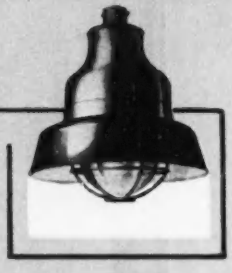
Rely on Quality

INDUSTRIAL

PYLE-NATIONAL LIGHTING FIXTURES

for longer service life, added Safety and Efficiency

EXPLOSION-PROOF

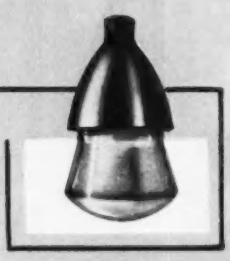


Pyle-National LE Series (Class 1, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

DUST-TIGHT

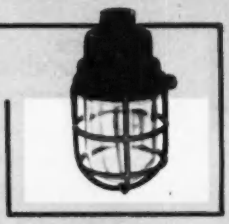


Pyle-National DE Series (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

VAPOR-TIGHT



Pyle-National BO Series

For use in any outdoor or indoor location subjected to heavy concentrations of non-flammable vapors, gases, dusts, or moisture.

Heavy duty construction and especially efficient sealing features insures an exceptionally long service life. Full line for 10 to 200 watt lamps.

VAPOR-TIGHT SIGNAL OR PILOT LIGHTS

Midget Fixtures for 10 watt Lamps.

ENCLOSED FLOODLIGHTS

Sealed against moisture and dirt, constructed throughout of cast aluminum and other rugged, corrosion-proof materials, Pyle-National floodlights retain their original high-efficiency output throughout an exceptionally long service life, with negligible maintenance and replacement expense.

WEATHER-PROOF RAIN-TIGHT

SINCE 1897

THE PYLE-NATIONAL COMPANY

1385 N. KOSTNER AVENUE • CHICAGO 51, ILLINOIS

District Office and Representatives in Principal Cities of the United States. Export Department: International Railways Supply Co., 30 Church St., New York. Canadian Agent: The Holden Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver.

CONDUIT FITTINGS • PLUGS AND RECEPTACLES • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

Here's why your plant needs a GAI-TRONICS Power Plant Communication System

...custom-built by Power Plant Design-Engineers!

EFFICIENCY! *Everyday-operations* run *smoother* because a modern GAI-TRONICS System is *fast* and *sure*. Critical manpower is used most effectively. Executives, operators, departments, and maintenance men are called by *name* instead of by slow, confusing code calls. Two-way or group conversations take place over special telephone handsets. These are designed for noise-free operation in *extremely high noise* areas even without acoustic booths! GAI-TRONICS has proved itself in the plants of many electric utilities throughout the United States and abroad.

EMERGENCY! *When trouble occurs*, a GAI-TRONICS System alerts and coordinates all affected areas *by voice* at once—even though the system is otherwise in operation. All areas can hear all sides of emergency instructions, if necessary, or telephone-type privacy may be had at the flick of a switch! Maintenance men can be located and dispatched to the job without delay.

ECONOMY! *A* GAI-TRONICS *System* is surprisingly low-priced because it is designed, by men thoroughly acquainted with power plant requirements, to provide *all* internal communication facilities in *one* system! By preventing damage to costly plant equipment and keeping your plant "on-the-line" during an emergency, a GAI-TRONICS System may pay for itself in minutes! *Fast* and *sure* GAI-TRONICS communication minimizes accidents, misunderstood orders, improves labor relations, and lowers production costs.

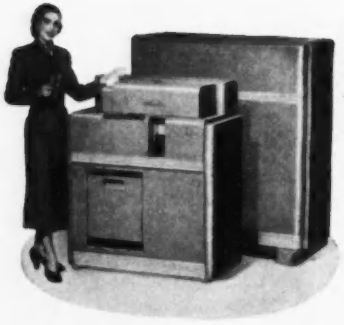
FREE ... a booklet or a demonstration! POWER PLANT COMMUNICATION SYSTEMS is an informative booklet showing GAI-TRONICS at work under the most difficult sound conditions. Read it before deciding on communications for your plant. It will save you money! If you should like a demonstration ... we will bring a portable GAI-TRONICS unit to your plant and prove its worth under any noise conditions! Write today!

GAI

New Power in Your Grasp!

Payrolls computed in minutes . . . bills calculated with the speed of light . . . complex engineering problems solved faster than the problems can be stated.

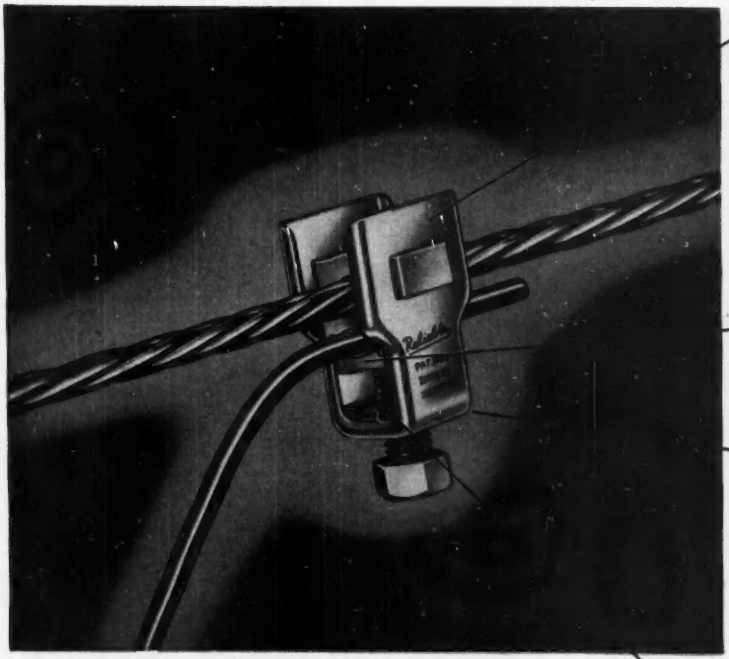
This is only a sample of the power put in your hands by the pluggable IBM Electronic Tube Assembly, the heart of the IBM Electronic Calculator. Here is power to do simple and complex calculation without the need for supervision of step-by-step operation . . . power to free men's minds from the burden of detail computation and to eliminate frequent human error.



IBM

INTERNATIONAL BUSINESS MACHINES
590 Madison Avenue, New York 22, N. Y.

Accents on Accuracy



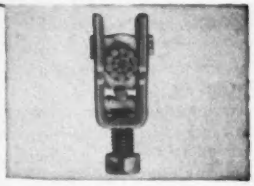
in the manufacture of

FLIP-ON TAP CLAMPS

Rugged, Reliable connections are assured with these precision Flip-On Tap Clamps. Accurately gauged threads and spacers always work smoothly—snug-up tighter, and then stay tight—while large bearing surfaces protect the conductors from damage. Carefully designed and carefully made, all parts are accurately heat treated. Their lighter construction of aluminum alloy reduces vibration fatigue. And where dissimilar conductors are used, spacers are provided with both copper and aluminum faces—to prevent electrolytic corrosion. Spacers accurately align conductors under screw pressure so that the joint gets the full benefit of direct (1:1 ratio) pressure. Reliable's accent on accuracy assures quick and easy installations—rugged, Reliable performance.

1. Precision dies and faultless equipment produce rugged body — wall slots are accurately parallel for easy, reliable pressure-clamping.

2. Exact manufacturing techniques assure these carefully engineered spacers give firm, reliable connections — without damaging conductors.



3. Nut is staked in body before tapping. Four full threads are continuous. Aligning fixture insures accuracy of direction. Pressure on conductors is directly under screw in opposite directions (ratio 1:1).

4. Accurately controlled electric furnaces bake long life and reliability into this tough aluminum alloy.

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

You can profit

from Manchester's Experience

Quick, Easy Expansion with Westinghouse Network Transformers

Public Service Company of New Hampshire envisioned Manchester as a city sure to grow . . . power requirements certain to increase. That's why an underground secondary network system was installed . . . to give the flexibility needed to accommodate extensions, load shifts and future growth *economically.*

Already these predictions have come true. But the network system offered a simple solution. A number of new 500-kva Westinghouse Network Transformers were quickly and easily installed throughout the city.

Here's the transformer that offers greater savings in initial cost . . . and these *plus* features:

STANDARDIZED electrically and mechanically to meet industry requirements . . . to improve delivery and reduce costs.

CONTINUOUS WINDINGS with sliverless copper.

HIGH AND LOW-VOLTAGE COILS accurately centered to minimize short-circuit stresses.

SINGLE RESPONSIBILITY — transformer, network protector, rotary switch all supplied by one manufacturer.

Westinghouse helped develop the network system over 29 years ago and has continuously pioneered new developments. Complete facilities including board analysis and competent engineers can help with your system planning. Call your nearest Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70614

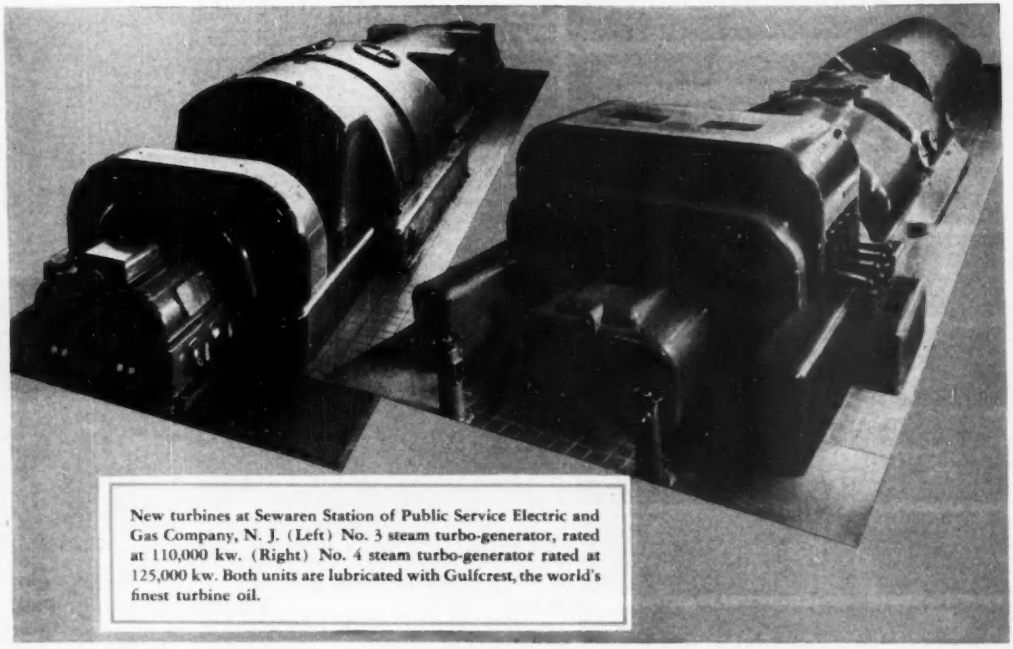
YOU CAN BE SURE... IF IT'S

Westinghouse

NETWORK TRANSFORMERS

Gulfcrest Oil selected for two more big turbines—

110,000 kw
125,000 kw
235,000 kw



New turbines at Sewaren Station of Public Service Electric and Gas Company, N. J. (Left) No. 3 steam turbo-generator, rated at 110,000 kw. (Right) No. 4 steam turbo-generator rated at 125,000 kw. Both units are lubricated with Gulfcrest, the world's finest turbine oil.

Two more turbines get the safe, sure, long-lasting protection of Gulfcrest, the world's finest turbine oil!

Extra refining makes the difference! After the carefully selected crude oil used in Gulfcrest goes through the major refining methods, it is then super-refined by the Alchlor Process.

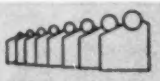
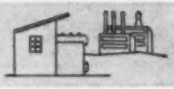
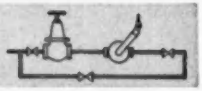
This exclusive Gulf process removes the hydrocarbons most apt to oxidize and form sludge, emulsifiers, and harmful acids in turbine lubricating systems.

That's why Gulfcrest is exceptionally stable—why it gives outstanding performance, and lasts indefinitely. Call in a Gulf Lubrication Engineer today for complete information on this superior oil. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company
Gulf Building, Pittsburgh 30, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

Combined features that distinguish Foster Wheeler package steam generators

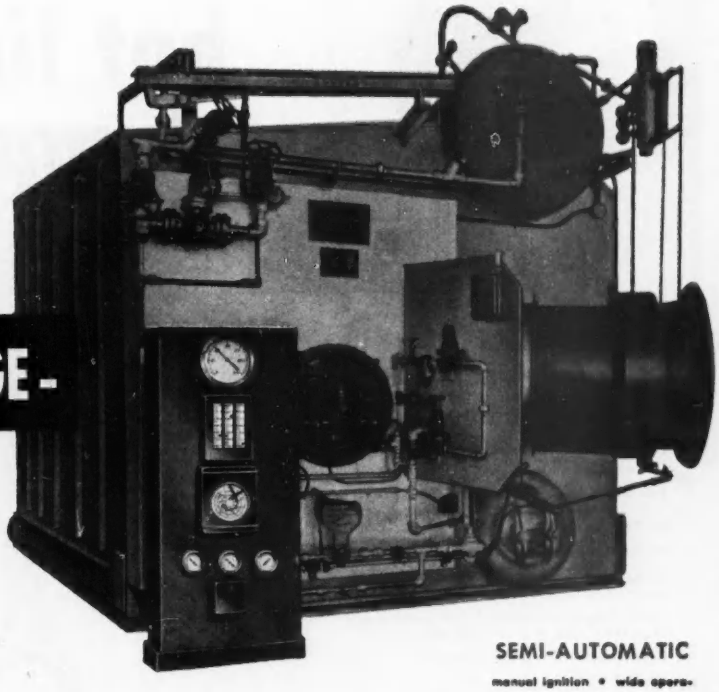
WATER TUBE DESIGN	Vertical tubes,...steady water level, closely spaced waterwall tubes on 3½" centers
FACTORY ASSEMBLED STEAM PLANT	Compact, self-contained steam generating units
WIDE RANGE OF CAPACITIES	7,500 to 30,000 lb per hr . . . flexible multi-unit installations for greater capacities 
HIGH STEAM TEMPERATURES	Provisions for superheaters in some designs
PORTABILITY	May be transported by common carrier . . . minimizes problems of initial installation and plant relocation
EXPERIENCE	50 years' design, engineering, manufacturing of power plant equipment behind each Foster Wheeler unit
EASILY INSTALLED	Simple foundations . . . few service connections
OUTDOOR INSTALLATION	Rugged, steel encased construction 
ACCESSIBILITY	For inspection,...cleaning, maintenance
COMBUSTION CONTROLS	Fully or semi-automatic controls for single or multi-unit installations
CONTROL VALVES	Equipped with 3-valve by-passes 
CLEAN HEATING SURFACES	Soot blowers incorporated . . . cleaning without boiler shutdown
HEAT LOSS MINIMIZED	Minimum heat loss—from radiation and air infiltration
RAPID LOAD SWINGS	Large diameter drums and ample furnace heating surface

all for the price

FULLY AUTOMATIC

push-button start • operation at all pressures up to design pressure

# of a PACKAGE-



SEMI-AUTOMATIC

manual ignition • wide operating range • modulating control

When faced with the need for a reliable and economic source of steam for your plant, look for these marks of quality and efficiency—water-tube design, generous proportions, electronic controls—notable attributes of the Foster Wheeler Package Steam Generator available in capacities from 10,000 to 30,000 lb of steam per hr. • Write for CATALOG PG-51-2.

FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

count these extras in...

WEAVER

hot line clamps

1-WS
Electro-Bronze for Copper to copper.
Also available Cadmium Plated for General Purpose Use.

12 Outstanding Advantages ... Competitive Prices

- Cast of high strength electro-bronze or aluminum alloy in our own modern foundry.
- Two clamps accommodate all main line wire sizes from 8A Copperweld to 1/0 Aluminum Over Armor Rods and all tap wire sizes from 8A Copperweld to 2/0 Copper or 1/0 ACSR.
- Ampere rating exceeds rating of maximum wire size.
- Clamps will withstand tightening torques far in excess of normal operating requirements.
- Sufficient clearance provided on all sizes to make application on maximum wire sizes easy and efficient.
- Main line saddle attached securely to tightening pin eliminates breaking or loosening.
- Free running threads efficiently convert tightening torque to pressure on conductor.
- Weaver exclusive lubricated bronze insert on aluminum clamps prevents seizure between pin and body.
- Aluminum alloy clamps are heat treated for maximum strength.
- Round or V-Shaped wire bearing surface available.
- Main pins furnished with National Course or National Fine threads at no difference in cost.
- All types and sizes will fit standard hot sticks.

WSB-C
Cadmium Plated for General Purpose Use.
Also available in Electro-Bronze for Copper to Copper or Heat Treated Aluminum for Aluminum to Aluminum or Aluminum to Copper.

WEAVER PRODUCTS ARE PRODUCED COMPLETELY IN OUR OWN MODERN INTEGRATED FOUNDRY AND FACTORY FACILITIES
VISIT US WHEN YOU ARE IN ST. LOUIS.

J. A. WEAVER Company

2110 HOWARD ST. • ST. LOUIS 6, MO.

TELEPHONE CEntral 0881

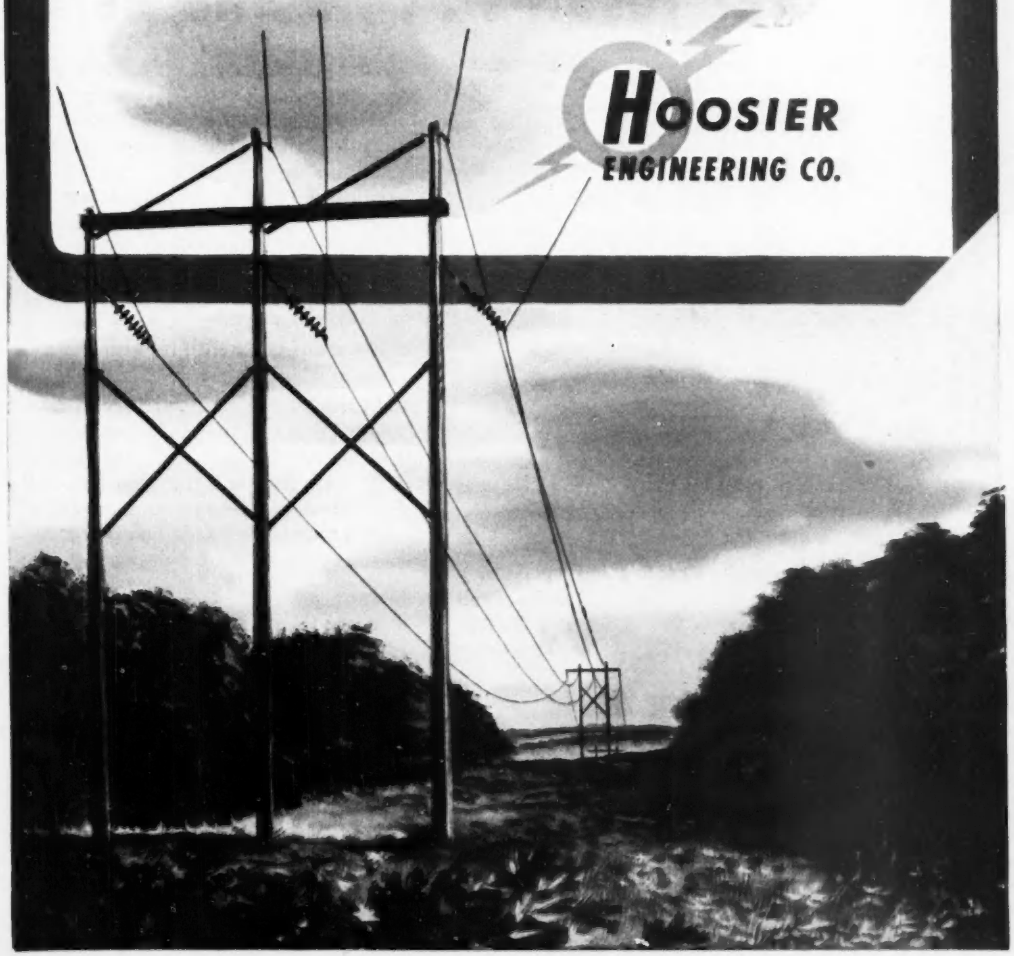
The Tougher the Job . . .

the more we can help. For Hoosier engineers are more experienced in handling the erection and maintenance jobs that have proved unusually difficult for utilities throughout the country. Hoosier engineers, trained men and special equipment are available at any time to supplement your own organization or work independently.

ERECTION AND MAINTENANCE OF TRANSMISSION LINES

NEW YORK • **1384 HOLLY AVE., COLUMBUS, OHIO** • CHICAGO

HOOSIER
ENGINEERING CO.



"Net result . . . . . no net!"

Chrome plate sparkling — baked enamel finish shining — all snugly packed in special cartons and ready to go — 20,000 car heaters. The last of the lot — at a good profit, too! Production costs had been cut to the bone. Bill Johnson was proud of that record, and of the net he would show at the end of the month. Then . . . back came some belated field test reports on a trial shipment. The new electrical insulation on the switch leads, that had cost a few cents less, wouldn't take the heat and vibration, and was cracking off. Unpack — replace insulation — repack — on 20,000 car heaters. Net result — no net!

Often it's little failures that chain react into big losses. Protect your products with BH Extra Flexible Fiberglas Sleeving — permanently flexible insulation.

Specifically designed for low voltage circuits where high heat resistance and flexibility are vital factors, BH Ex-Flex is also important as supplementary insulation. Made without hardening varnish or lacquer it is permanently non-stiffening and retains its flexibility from −67°F to 1200°F, with color retention up to 300°F. It is non-combustible. The easy-to-handle tubular shape provides maximum speed and convenience in installation. Patented braid treatment further reinforced by a special saturant allows BH Ex-Flex to be cut in short lengths, spread to cover knobs and terminals, yet prevents fraying or raveling.

BH Extra Flexible Fiberglas Sleeving is one of a family of BH insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements — product, temperatures, voltages. We will furnish production samples for testing.

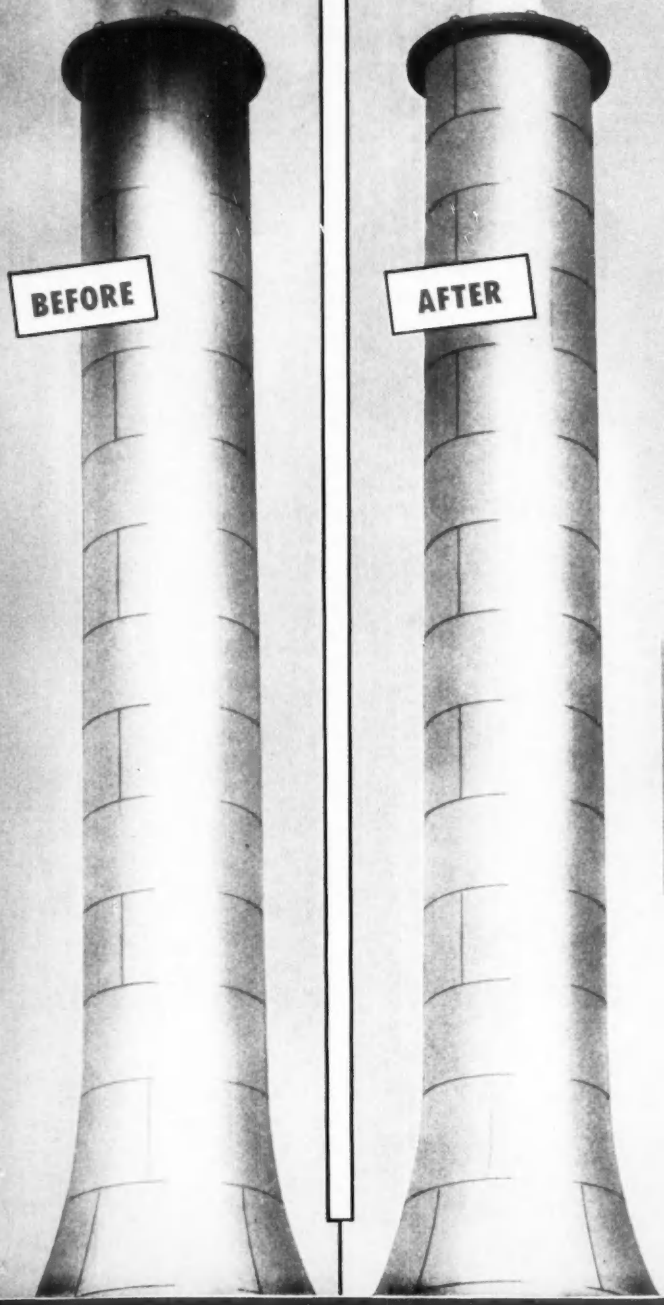
Address Dept. W-1

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

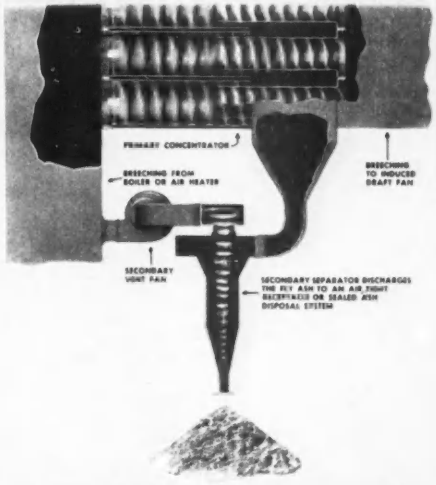
American Blower . . . a time-honored name in air handling



Installation of an American Blower Type ST Fly Ash Precipitator can make the difference shown here.

On a given application, as the load falls off and fly ash becomes harder to catch, the ST Precipitator automatically maintains a higher efficiency than any other collector of mechanical type.

Contact the American Blower or Canadian Sirocco Branch Office nearest you. They are conveniently located throughout the United States and Canada to provide complete information concerning the benefits of installing fly ash precipitators in your plant to meet your specific needs. Call on one today.


PRIMARY CONCENTRATOR
BREECHING FROM BOILER OR AIR HEATER
BREECHING TO INDUCED DRAFT FAN
SECONDARY VENT FAN
SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR-TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

AMERICAN BLOWER

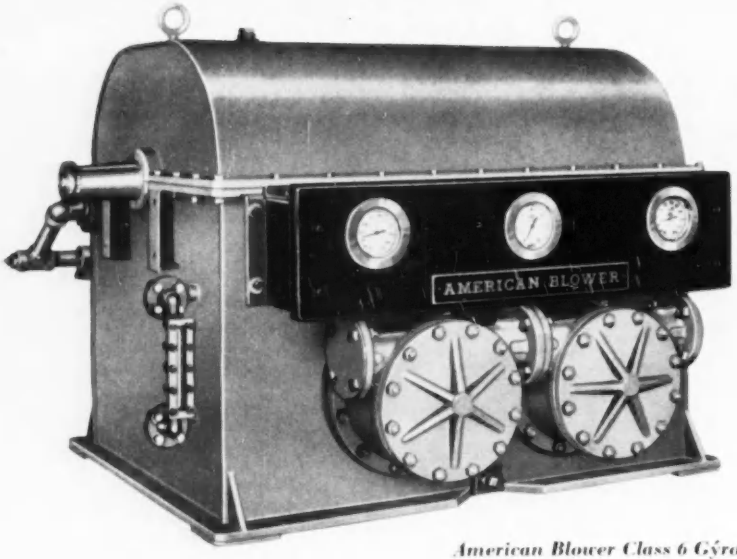
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

American Blower . . . a time-honored name in power plant equipment



American Blower Class 6 Gyrol Fluid Drive

Memo to Power Plant Men —

You can enjoy important power savings, flexible stepless control, reduced maintenance, and get lower pressures at reduced flows for your boiler-feed-pump operation. Install an American Blower Adjustable Speed Gyrol Fluid Drive with a constant speed driving motor.

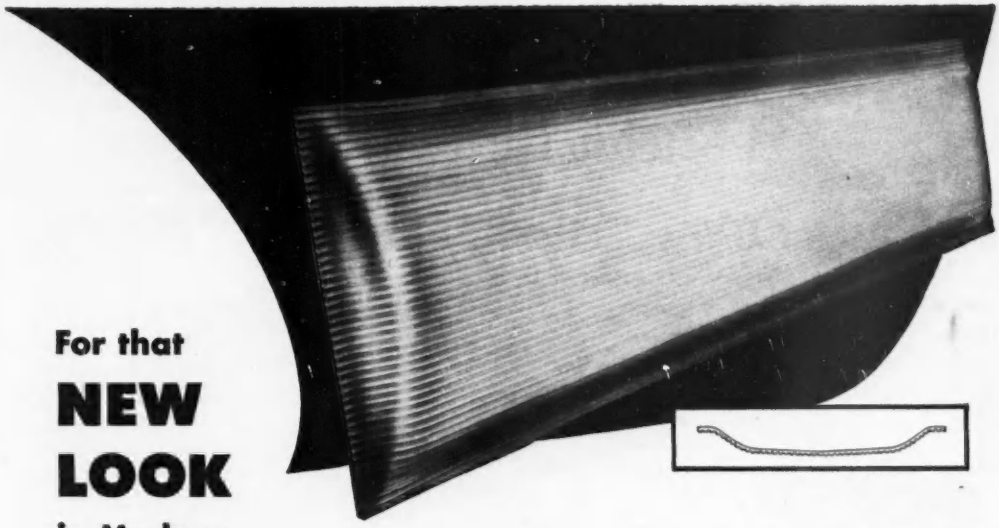
AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



For that

NEW LOOK

in Modern Interior Styling

... New Curved

ALBA-LITE

New curved panels of popular ALBA-LITE enhance the clean-lined styling of modern interiors. Their long lengths minimize the number of visible joints in continuous runs—give rooms that smooth new look and freshness.

Made in open and closed end pieces in lengths up to 48″, they are adapted to standard fixture construction of both the hinged door frame and continuous open trough types. Unlike other materials, ALBA-LITE will not sag, warp, discolor or scratch. Maintenance costs are minimized ... cleaning is a matter of seconds.

The soft opal glass in these new panels diffuses light evenly throughout the room, providing fixtures with controlled brightness and a pleasing appearance both when lighted and when not in use.

Curved ALBA-LITE panels are available through all leading fixture manufacturers, many of whom feature ALBA-LITE in their fixtures. If you are seeking new treatments or new solutions to standard lighting problems, send for Bulletin LS-32 and a set of Photometric sheets describing ALBA-LITE and other Corning engineered lightingware. They are yours for the asking.

ALBA-LITE is also available in 3 standard patterns in flat sizes up to 24″ x 100″, or bent to your particular specifications. It is adaptable to any type installation where color fidelity, high light efficiency, and maximum design flexibility are needed. It is ideally suited for totally direct lighting in luminous ceilings and recessed fixtures, or for semidirect lighting in suspended fixtures.

PYREX

CORNING GLASS WORKS

CORNING, NEW YORK

Corning means research in Glass

VISIT THE NEW CORNING GLASS CENTER

Technical Products Division: Laboratory Glassware, Signalware, Glass Pipe, Gauge Glasses, Lightingware, Optical Glass, Glass Components

CORNING GLASS WORKS, Dept. EW-1, Corning, N. Y.

Please send ☐ Bulletin describing Curved ALBA-LITE panels; ☐ Photometric sheets.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

"The Accepted Standard with Utilities Everywhere"

LINE CONSTRUCTION BODY (600C)
This workhorse of the utility industry can be furnished in lengths from 9' to 14' for any type of utility construction work.

REVOLVING AERIAL LADDER
Models available in working heights of 23' 6", 26' 6", 30' 6", and 32' 6" for all styles of bodies.

GENERAL SERVICE BODY
Available in a wide range of body styles to fit operating requirements in all phases of the utility industry. Models can be furnished for ½, ¾, 1, and 1½ ton chassis. Compartments can be equipped with shelves, bins, and accessories to suit individual needs.

COMPARTMENT SECTIONS
Available in 74", 84", and 104" lengths for all standard pick-up or express-type bodies.

LIGHT DUTY MAINTENANCE BODY (350)
This compact unit is widely used for service and light duty construction. Fold-over derrick can handle 40' poles.

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

The 1 Source
for all types of utility bodies and equipment!

There's no need to look further than *Powers-American* to solve all your utility body and equipment needs. Whether the job calls for a small service body for repair work, a line body for large construction jobs, or special equipment such as towers or ladders, *Powers-American* is *your* answer.

Leadership in construction, maintenance and service work in all phases of the public utility industry guarantees long life and trouble-free service. Write today for more information.

POWERS *American* DIVISION
ACF

PUBLIC UTILITY BODIES AND EQUIPMENT
McCABE-POWERS AUTO BODY COMPANY
5901 North Broadway, Saint Louis 15, Missouri

"Transmission" Type Protection for Distribution Lines

14.4 and 23 kv PACIFIC Type JCE

Motor-Compressed-Spring

OIL CIRCUIT BREAKERS

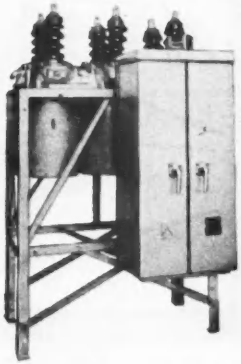
Shipped Assembled, Tested, and Adjusted

NEMA and ASA STANDARD Electrically and Mechanically Trip Free

Advanced Protective Performance—usually found only in large breakers for transmission lines—carries through even to the small PACIFIC Oil Circuit Breakers

At left: JCE-22 250,000 int. kva with end-mounted mechanism

At right: JCE-17 100,000 int. kva with side mounted mechanism



Also supplied, as above, with side-mounted operating mechanism for use where lengthwise space is at a premium.

RATINGS

Amp 14.4 kv:	Interrupting Kva
600	100,000
600	250,000
1200	250,000
23 kv:	
600	250,000
*1200	500,000

*Type JE

AS ALL Closing is from release of motor-compressed springs, any closing when once started is always under full force, regardless of drop of control voltage.

Thus when closing against fault, the blades cannot "drift in" when control voltage is low. Protection is thereby assured against the possibility of magnetic blow-back which might open the "a" auxiliary switch before the relay can close the tripping circuit. Slow opening and failure to interrupt are thereby eliminated.

Other features insuring reliability:

- Only one moving part in each tank—the one-piece rotary contact structure—under no stress except when operating;
- Sliding-shoe contacts—separate surfaces for arcing and load currents — self-cleaning — no adjustments;
- Control current no greater than tripping current — large wires not required;
- Full a-c if desired — without rectifiers;
- Emergency manual closing at full speed.

Write for Catalog 520

Sales Offices or Agencies in Principal Cities

PACIFIC ELECTRIC MFG. CORPORATION

5815 Third Street, San Francisco 24, California • 4500 Harrison St., Gary 10, Ind.

demand it in your wood preservative, too

When you pick a wood preservative, base your judgment on records of actual performance. Consider how much wood, treated with Creosote Oil in the past half century, is still in service today and good for years more service in the future.

U·S·S Creosote Oil is continually undergoing the severest test of all . . . actual service under some of the most adverse conditions of use. And it is proving again and again it has the combination of toxicity and permanence necessary to give your treated wood the longest possible service life.

Continuous processing in the world's largest tar distillation plant makes U·S·S Creosote Oil a uniform product that will give uniformly good results. For immediate shipment by tank car or barge, contact our nearest sales office or write directly to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS

U·S·S CREOSOTE OIL

UNITED STATES STEEL

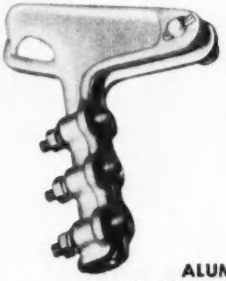
NO SHORTAGE OF THESE MATERIALS

FOR ACSR LINES

FORGED STEEL
BALL HOOK

MALLEABLE
SOCKET EYES

MALLEABLE
STRAIN AND SUSPENSION CLAMPS
FOR OVERHEAD GROUND WIRES



ALUMINUM
STRAIN AND SUSPENSION CLAMPS
DESIGNS APPROVED BY LEADING CONDUCTOR MFGRS • HIGHEST QUALITY
PRIME 195 ALLOY • COMPLETE RANGE OF SIZES

SUSPENSION INSULATORS
YEARS OF EXCELLENT SERVICE ON LINES OF MAJOR UTILITIES

ALL AVAILABLE FROM ONE RELIABLE SOURCE

Go ahead—Make your plans for ACSR lines and extensions. We'll see that you get the insulators and clamps! No shortages, No delays as long as you plan your needs with us. Write, phone or wire your local Porcelain Products representative.

YOUR INDEPENDENT INSULATOR MANUFACTURER

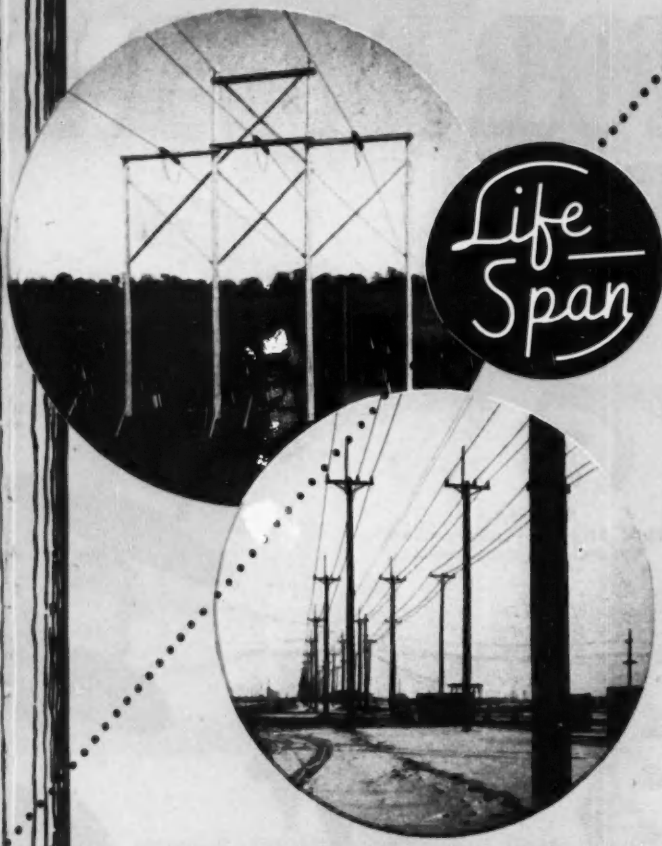
Porcelain Products, Inc.

PP INC.

The Quality Line PARKERSBURG, WEST VIRGINIA

LIFE SPAN *Cedar*

THE POLES THAT REFUSE TO GROW OLD



Life Span

Life Span

After 10 years of continual high-tension-line service, LIFE-SPAN treated Cedar poles are as perfect as they were at the time of installation. They still are 100% protected against deterioration and still retain 100% of the LIFE-SPAN preservative. Service life-expectancy is still ahead for all LIFE-SPAN poles.

A remarkable record which we at Consolidated Treating Co. are proud to report! We are still searching for the *first* LIFE-SPAN pole to show decay, or signs of any deterioration after 10 years of line service. Our chemists are continually making repeat tests on LIFE-SPAN installations in many parts of the country. To date, every pole tested shows true soundness, with years of line service still ahead.

Once the LIFE-SPAN pole treatment is applied, Western Red Cedar poles simply cannot rot!

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

Sold only by the following:

B. J. CARNEY & CO.
Spokane—Minneapolis

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for Joslyn Mfg. & Supply Co.

NAUGLE POLE & TIE CORP.
Chicago, Illinois

PAGE & HILL, INC.
Minneapolis, Minnesota
80 Church Street, New York, N.Y.

one of three

This is the newest and largest of three Roller-Smith and Elpeco plants concentrated in the busy Lehigh Valley industrial area of Pennsylvania. Since it went into operation last April, we have been turning out increasingly larger quantities of the high quality, precision engineered, electrical equipment for which Roller-Smith has been noted for more than 40 years. Despite existing material shortages, the additional facilities and machinery afforded us have made it possible for both Roller-Smith and Elpeco to design, build and ship in volume, vitally needed equipment, in a comparatively short time. We are making no rash promises, but—if you are looking for prompt shipment of truly superior electrical equipment for yourself, or for part of a defense contract—get in touch with us immediately. It is quite possible that we may be able to solve your own particular problem.

MANUFACTURERS OF

ROLLER-SMITH

- Oil and Air Circuit Breakers
- High and Low Voltage Switchgear
- Unit Substations
- Instruments
- Precision Balances
- Watthour Meters

ELPECO

- Disconnect Switches
- Outdoor Hook Stick Switches
- Air Break Switches
- Indoor and Outdoor Bus Supports
- Bus Ducts
- Substations

ROLLER-SMITH CORPORATION • BETHLEHEM, PENNSYLVANIA

Coupling Conduit?

it's easy...

with an O.Z. Split Coupling

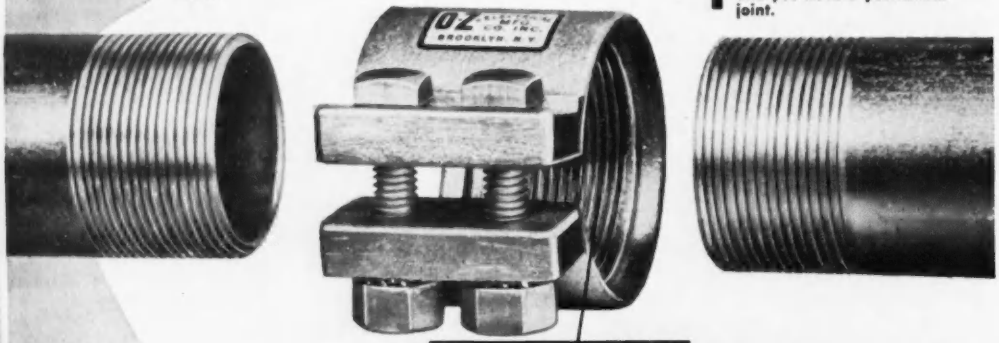
UL Approved

THESE YOUR PROBLEMS?

Not enough space
No room for wrench
Hard to get at
Conduits can't be turned

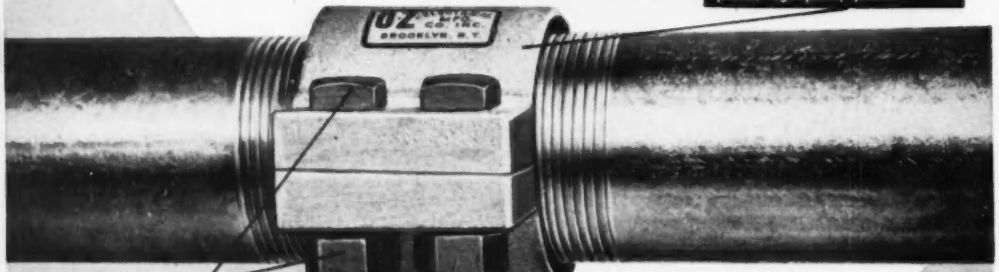
HERE'S YOUR ANSWER!

O. Z. is the simple, dependable way to couple conduit. Just butt the conduit ends within the opened O. Z. Split Coupling, tighten two nuts and you have a permanent joint.



Interior Threading — meshes with conduit threading for a rigid close-fitting connection.

Low Price — simple, one-piece malleable iron construction assures low-priced, high-quality product.



Low Installation Cost — simply slip over conduit ends and tighten nuts to close fitting. Bolt head is held in place by coupling shoulder.

Available for conduit sizes ranging from ½" to 5".

8192

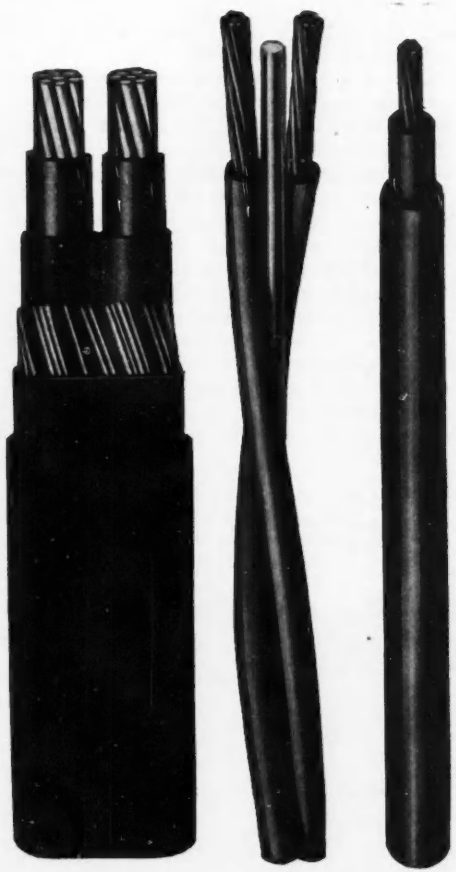
O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.

742 BOND STREET · BROOKLYN 2, N. Y.

Your local O. Z. distributor is ready now to serve you from stock. Get in touch with him for further information on the complete, dependable O. Z. line of electrical fittings.

CONDUIT FITTINGS · CABLE TERMINATORS · GROUNDING DEVICES
CAST IRON BOXES · SOLDERLESS CONNECTORS · POWER CONNECTORS

SERVICE ENTRANCE CABLES



TYPE SE TYPE SS TYPE USE

Roebling makes a wide line of service entrance and service drop cables.

SERVICE CABLES are an important part of Roebling's complete line of electrical wires and cables. Whatever your requirements for getting electrical energy from the utility's secondary to the meter, the right Roebling underground or overhead cable will give you the fullest measures of dependability...and economy.

All types and styles of Roebling Service Entrance Cable are made in the constructions best adapted for their own particular service range. From copper wires to protective jackets these cables are made entirely in Roebling plants where modern machines and methods assure highest, uniform quality.

A large part of Roebling's complete wire and cable line is required in today's rearmament program. You can count on the Roebling organization and distributors, however, to give you the best possible delivery service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

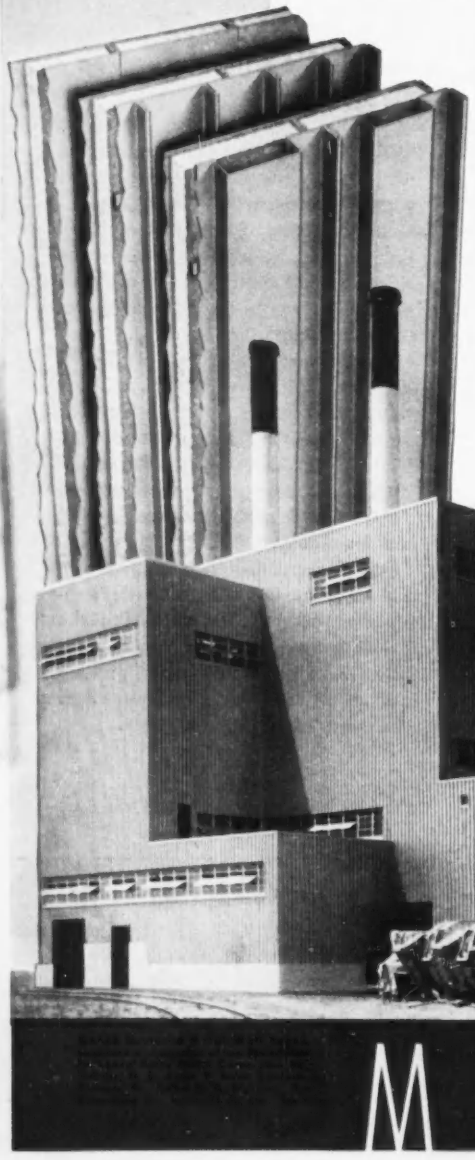
ROEBLING

Atlanta, 934 Avon Ave ★ *Boston*, 51 Sleeper St ★ *Chicago*, 5525 W. Roosevelt Rd ★ *Cincinnati*, 3253 Fredonia Ave ★ *Cleveland*, 701 St. Clair Ave, N.E. ★ *Denver*, 4801 Jackson St ★ *Detroit*, 915 Fisher Building ★ *Houston*, 6216 Navigation Blvd ★ *Los Angeles*, 216 S. Alameda St ★ *New York*, 19 Rector St ★ *Odessa, Texas*, 1920 E. 2nd St ★ *Philadelphia*, 230 Vine St ★ *San Francisco*, 1740 17th St ★ *Seattle*, 900 1st Ave, S. ★ *Tulsa*, 321 N. Cheyenne St ★ Export Sales Office, *Trenton, N. J.*

INSULATED METAL WALLS

for INDUSTRIAL and COMMERCIAL BUILDINGS

ALUMINUM, STAINLESS or GALVANIZED STEEL



The Power Plant illustrated below is further evidence of a design trend and the prominent place Insulated Metal Walls occupy in present day construction . . . it is typical of fourteen structures, including two complete industrial plants, presently under construction—and dozens of others in the planning stage. The exterior wall surfaces of this building are Stainless Steel throughout . . . permanent, firesafe material requiring no maintenance whatsoever. Mahon Insulated Metal Walls are available in three distinct exterior patterns as shown at left. Walls may be erected up to 50 feet in height without horizontal joints. Thermal properties are excellent—insulation provides an overall "U" Factor equivalent to that of a conventional 16" masonry wall. Mahon Insulated Metal Walls, together with a Mahon Steel Deck Roof, provide the ultimate in economy, permanence, and firesafety in modern construction. See Sweet's Files for complete information, or write for Catalog No. B-52-B.

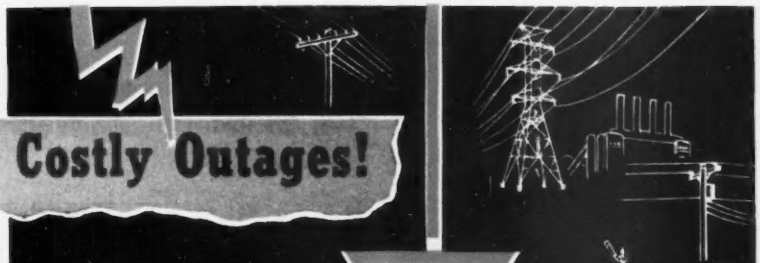
THE R. C. MAHON COMPANY

Detroit 34, Mich. • Chicago 4, Ill. • Representatives in Principal Cities

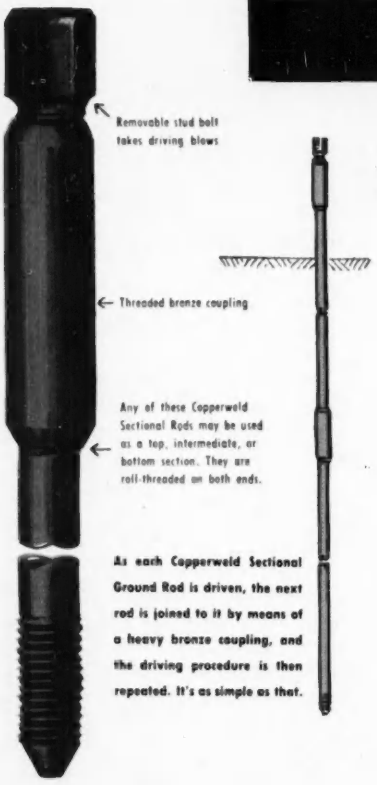
Manufacturers of Insulated Metal Walls; Steel Deck for Roofs, Floor and Partitions; Rolling Steel Doors, Grilles, and Underwriters' Labeled Rolling Steel Doors and Fire Shutters.

MAHON

OUT with Costly Outages!



GET PERMANENT DEEP-DOWN PROTECTION WITH Copperweld


Removable stud bolt takes driving blows
Threaded bronze coupling
Any of these Copperweld Sectional Rods may be used as a top, intermediate, or bottom section. They are roll-threaded on both ends.
As each Copperweld Sectional Ground Rod is driven, the next rod is joined to it by means of a heavy bronze coupling, and the driving procedure is then repeated. It's as simple as that.

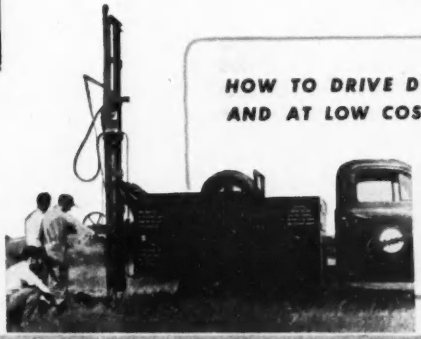
SECTIONAL GROUND RODS

In most localities deep grounding will provide low resistances more economically than multiple shallow grounds. More and more engineers are turning to Copperweld* Sectional Ground Rods for this deep-down protection. These superior ground rods do the job quickly, permanently and at low cost.

Copperweld Sectional Ground Rods have a stiff alloy steel core to provide the rugged strength for easy driving. This core is permanently protected from corrosion by a thick, molten-welded layer of copper having high conductivity. No other ground rod has this inseparable molten-weld which eliminates the possibility of electrolytic action.

Whether you drive only a few lengths by hand or penetrate the earth's sub-surface with the aid of a power hammer, you can do it quicker, better, and at low cost with Copperweld Sectional Ground Rods. And at the same time, you'll get permanent and consistent low-resistance grounding protection against costly outages.

*Trade Mark



HOW TO DRIVE DEEPER AND AT LOW COST

Equipped with a demountable steel framework supporting a Barco gasoline hammer, this truck is demonstrating that effective, low-resistance deep grounding can be accomplished in a simple, economical manner with Copperweld Sectional Ground Rods. You can readily duplicate this rig in your own shops. Complete plans will be mailed to you upon request.

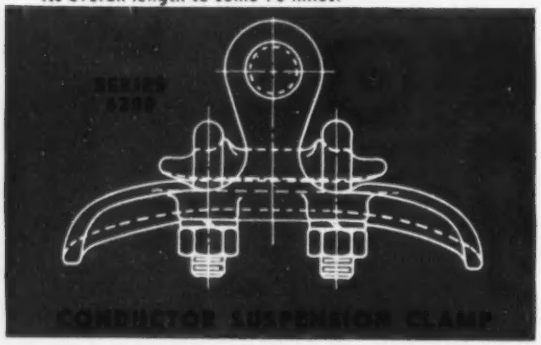
Made by
COPPERWELD STEEL COMPANY
Glassport, Pa.

THEY'RE MOLTEN-WELDED Copperweld GROUND RODS

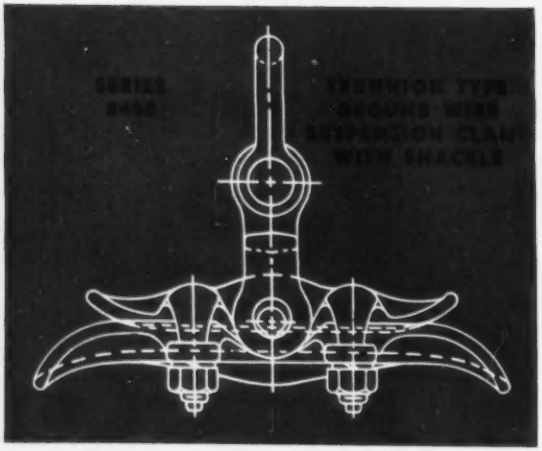
Stocked And Sold By:
HUBBARD AND COMPANY • JOSLYN MFG. & SUPPLY CO.
And All Their Distributors

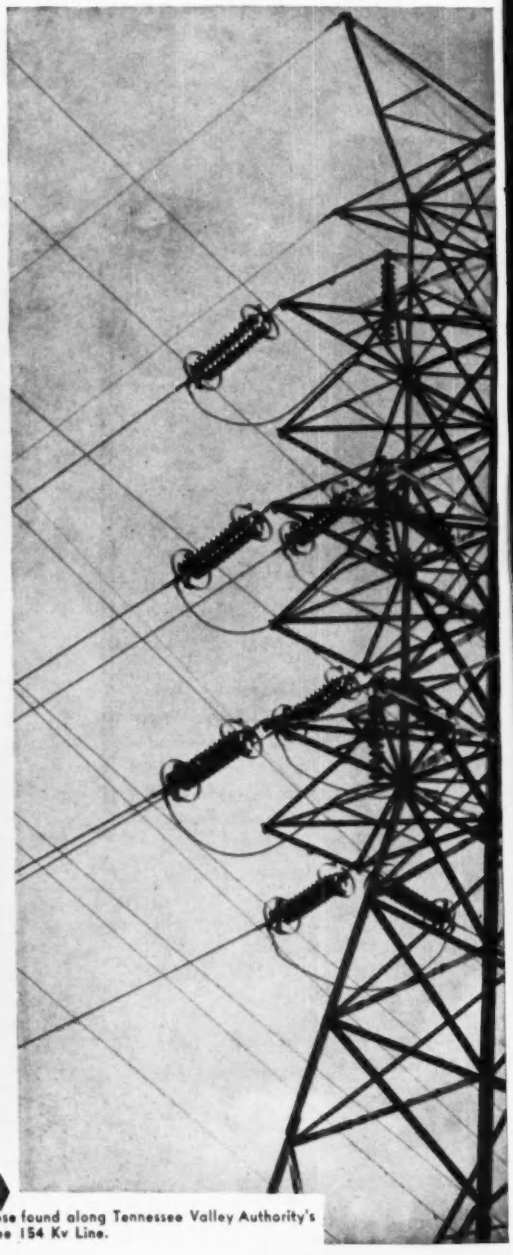
TIE LINE IN

THIS 154 Kv line crosses rolling country and mountainous terrain to connect Tennessee Valley Authority's Chickamauga Dam with its Hiwassee Dam 65 miles away. Constructed in 1940, the line later was looped into Apalachia Dam and Cleveland Primary Sub-station bringing its overall length to some 70 miles.



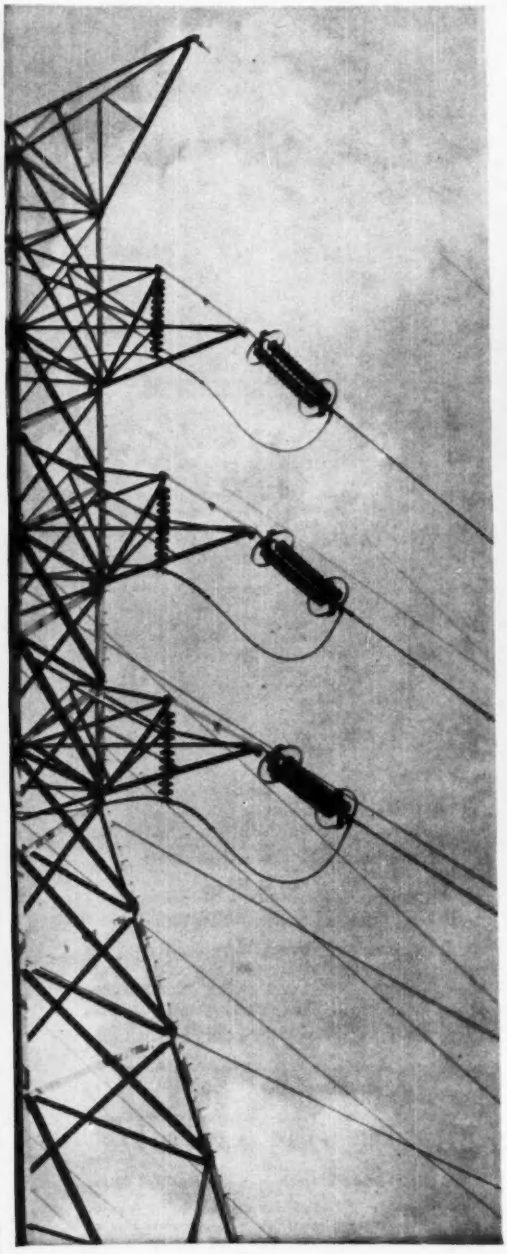
Serving as a tie between hydro-electric plants, this TVA line employs 636,000 cm A.C.S.R. Conductor under 9000 lbs. tension, 7/16" H.S. Steel Ground Wires at 6000 lbs., 1400 ft. spans, 1/2" ice and 8 lbs. wind at 0° F. BTC Drop Forged Steel Clamps and Transmission Line Hardware were installed when the line was erected.



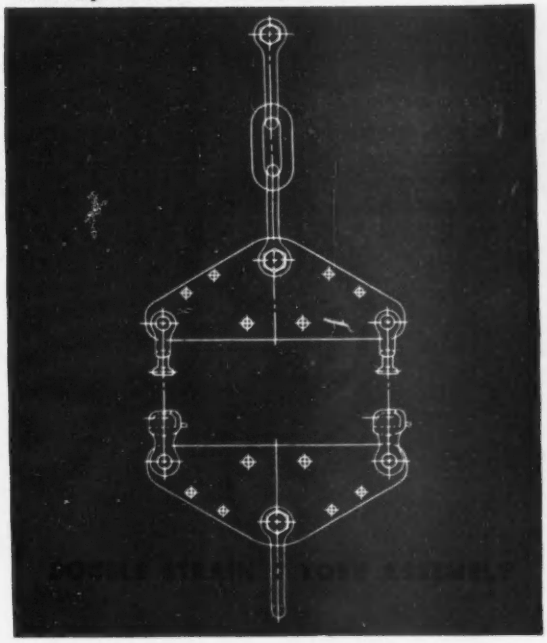


TYPICAL 90° TOWER • This double circuit dead end 90° angle tower is typical of those found along Tennessee Valley Authority's Chickamauga-Hiwassee 154 Kv Line.

TENNESSEE



● **END OF THE LINE** BTC Insulator Hardware, shown here, is installed on a double circuit dead end tower, located near the Chickamauga end of this 154 Kv. line.



Why not specify BTC Drop Forged Clamps and Fittings for all your transmission line projects? You'll find — as so many utilities and construction firms already have found — that BTC Clamps and Fittings are easier to install, give efficient trouble-free performance and help keep maintenance at a minimum.

Sold Through Your Insulator Manufacturer Only.

Drop Forged BTC Hi-Line Hardware

The BREWER-TITCHENER Corporation

Cortland · New York

Leaving the STRESS where it belongs...

Stress relieving prefabricated piping with highly developed equipment and special techniques is one reason why exacting specifications are met with

GRINNELL PREFABRICATED PIPING

Grinnell received an order recently for stress relieving prefabricated piping to these specifications:—

> "All fabricated pieces shall be normalized and drawn by heating to a uniform temperature of 1700°F (plus or minus 25°F). This temperature shall be maintained on a basis of one-half hour for each quarter inch of wall thickness of the heaviest pipe in the furnace charge followed by air cooling not less than 600°F. All pieces shall then be reheated to 1425°F and held at temperatures as above. In no case shall the time be less than 2 hours . . . Cool at a controlled rate not to exceed 200°F per hour until 600°F is reached . . ."

Grinnell, of course, met these specifications precisely. In fact, fabricating industrial piping today demands the *maximum* in versatility and precision.

Modern power plants, for example, need piping of heavy cross-sectional area and definite alloy composition to provide high temperature stability, resistance to creep and graphitization. Chemical and oil refining processes, on the other hand, must have piping of high chrome alloy to impart strength at high temperatures, resist corrosion, withstand impacts at low temperatures. Heat-treating often is the only answer — either to restore properties affected during fabrication, or improve original properties.

GRINNELL'S AUTOMATIC HEAT-TREATING FURNACE

performs with positive efficiency. This versatile stress-relieving unit, measuring 12 by 12 by 40 feet and using gas or oil or both as fuel, was designed to give full program control for the entire range of working temperatures. It provides instrument control of rate of rise in temperature of the charge, length of time for holding at the predetermined temperature level, and cooling rate. Two recording controllers are provided for the furnace and a separate 6-point recorder registers the temperatures of the charge simultaneously during the treating cycle.

Exterior View of Building

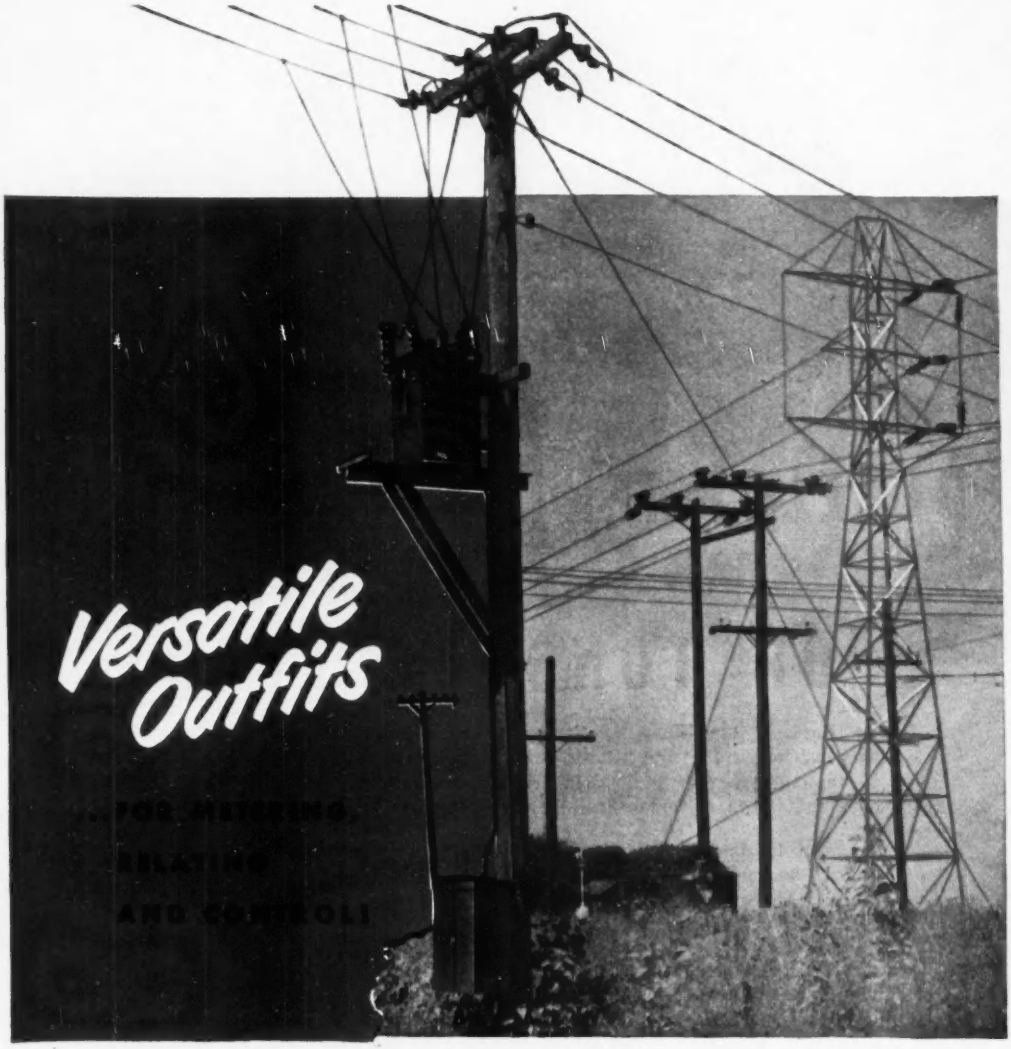
In heat-treating, as in everything else for piping, Grinnell has the experience and the costly equipment to fully protect large piping expenditures. That is why it will always pay you to call on Grinnell for *all* of your piping needs.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems



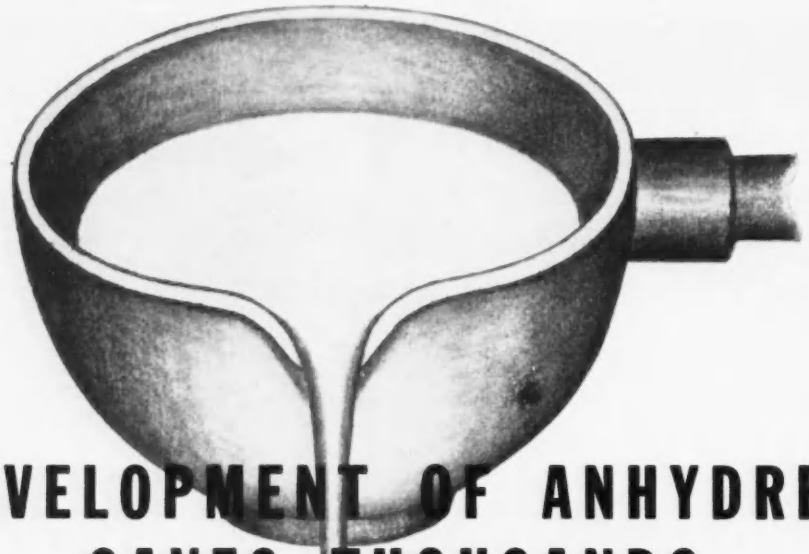
Current and potential transformers are combined in one unit for single or three-phase systems, 2.5 to 161 kv, in Westinghouse Type MP Metering Outfits. Enclosed in pressure-tight steel cases, with cover-mounted bushings and cover-suspended elements, they meet highest accuracy standards.

Because he handles the most complete line in the industry, your Westinghouse representative has specific answers for all your instrument transformer problems. Call him today, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70618

YOU CAN BE SURE...IF IT'S Westinghouse

INSTRUMENT TRANSFORMERS



DEVELOPMENT OF ANHYDREX SAVES THOUSANDS OF TONS OF LEAD

Research sometimes pays large and unexpected dividends. When Simplex was developing the first rubber-jacketed underground cable, our object was to eliminate the use of lead in order that you might have lighter cables, ones that were easier to install, and were very much easier to splice.

Now it appears that another dividend, unexpected but valuable nevertheless, has accrued from this research work. In fact, the development of the first rubber-jacketed underground cable has opened the door to enormous savings of one of our vital national resources.

Today millions of feet of cables that without Simplex research would have required thousands of tons of lead for cable sheaths, are operating dependably in all types of jobs, from airport lighting to railway signaling. Instead of being used for cable sheaths this lead can now be used for much more important service for everything from storage battery plates to tetraethyl lead for gasoline.

ANHYDREX is only one of many improvements in the art of cable manufacture to come out of Simplex Research and Development Laboratories.

SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Since 1933..

ALLIS-CHALMERS 5/8% STEP VOLTAGE REGULATOR

CONSTANT IMPROVEMENT IN VOLTAGE REGULATION

Introduction of 5/8% step voltage regulation nineteen years ago by Allis-Chalmers has opened way for increasing customer satisfaction and utility profits

To improve the efficiency of voltage regulation and reduce costs, 19 years ago Allis-Chalmers introduced the first 5/8% step regulator. Until 1933, regulators then in use had been thought good enough. But Allis-Chalmers proved that better regulation could be provided.

After analyzing the problem, Allis-Chalmers engineers decided that a major improvement could be made in voltage regulation if a regulator could be built with thirty-two 5/8% steps. First the problem of applying tap-changing under-load equipment to conditions of frequent operation had to be solved.

And in the regulator introduced in 1933, Allis-Chalmers had the answer. The mechanism had stood up under 5,000,000 test operations — equivalent to 100 years of normal operation. Contacts had stood up under 2,000,000 operations under load — equivalent to 40 years of normal operation.

The new regulator showed impressive operating results: better regulation, lower losses, less maintenance, and lower cost than any regulator then on the market.

Best of all, now it was possible to build a regulator to handle high voltage circuits as well as the lower voltage circuits. The need for hundreds of feeder voltage regulators was eliminated.

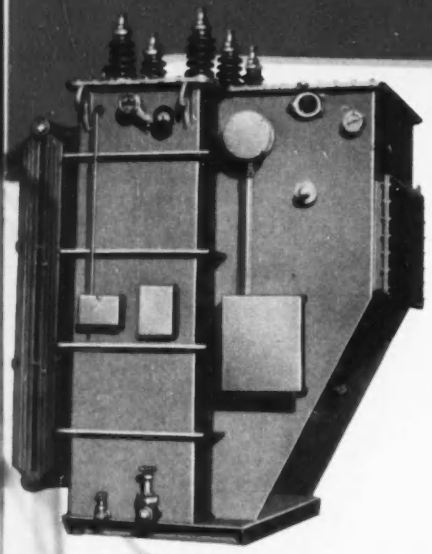
This was just the first of many Allis-Chalmers innovations that improved regulation. Read the following pages for the complete story.

ALLIS-CHALMERS

Originators of 5/8% Step Regulators

A-3593

19 Years of 5/8% Step GIVE YOU COMPLETE LINE OF FIELD



THREE-PHASE REGULATORS OFFER LATEST ALLIS-CHALMERS DESIGN FEATURES

Available in sizes through 69 kv, 2500 kva, Allis-Chalmers AFR regulators are equipped with LONG-LIFE CONTACTS made of non-burning metals for greatly reduced deterioration. HEAVY DUTY DRIVING MOTORS operate under oil and require no maintenance . . . they will withstand stalled current without injury. VOLTAGE INTEGRATION and "FEATHER-TOUCH" CONTROL provide better regulation under a variety of load conditions. SHOCK ABSORBING QUICK-BREAK MECHANISM operates on balanced spring principle to snub fast moving parts to standstill after a tap change is made. In units of 15 kv and below, UNIT CONSTRUCTION results in 78 fewer bolted connections and easier maintenance.

1933 1952

Nineteen Years of Developing Regulator "Firsts"— Many New Features Adopted by Entire Industry

Allis-Chalmers research did not stop with the introduction of the first 5/8% step regulator in 1933. Nearly every year since then has brought new features for the improvement of voltage regulation. Many of these new features have been adopted by other manufacturers in the industry.

Through its never-diminishing research, Allis-Chalmers has built an impressive record of "firsts." And new developments are being added to the list each year.

1933—First with 5/8% step regulation. Not only did Allis-Chalmers provide 5/8% step regulation first, but since 1933 Allis-Chalmers has been the only manufacturer to provide the advantages of 5/8% steps in all ranges. In 1941, 5/8% steps became standard in three-phase regulators.

1933 — First with Long-Life Contacts. Since 1933, all Allis-Chalmers regulators have been equipped with sintered RS-1045 arcing contact material to give hundreds of thousands of trouble-free operations. Not adopted by any other manufacturer till 1942.

1934—First outdoor-indoor universal regulator. A unit that permitted far more flexible installation. Adopted as standard in 1938.

1935 — First Voltage Integrating Time Delay. It actually integrates the voltage and causes the regulator to respond accordingly. Feature approaching this equipment not adopted by any other manufacturer till 1940.

1936 — First Oil-Sealed Inert-Gas System for High Voltage Regulators. Reduces maintenance. Not adopted by another manufacturer till 1949.

Originators of 5/8% Step Regulators

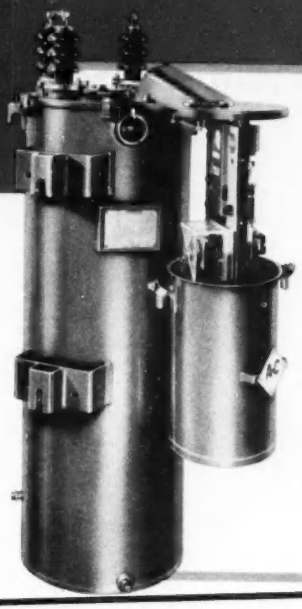
Regulator Development
TESTED VOLTAGE REGULATORS

DFR REGULATORS PROVIDE COMBINATION OF QUALITY FEATURES FOR SINGLE PHASE

The *Vari-Amp* feature on the DFR regulator for single phase operation provides five operating ranges instead of the two ranges provided on other types of regulators. As loads increase ranges can be reduced in proportion —they don't have to be sliced in half.

Greater short circuit capacity is also available thanks to the *Vari-Amp* feature. And adjustment is greatly simplified since one man can change ratings in thirty seconds. No taping, bypassing, or changing of connections is required.

And don't forget the exciting current advantage of the ⅝% step regulator. Because ⅝% step regulators use only ⅓ the exciting current of other types, you get more KVA for useful load from existing capacity. ⅝% step regulators use no more exciting current than a transformer of similar rating.



EFFICIENT REGULATION AT LOW COST FOR FEEDER OR SUBSTATION APPLICATION

Allis-Chalmers JFR ⅝% step voltage regulator is available in ratings up to 50 amperes. The low price tag on this pole-type regulator makes it possible to bring the advantages of ⅝% step regulation to the smallest branch lines.

Like every Allis-Chalmers ⅝% step voltage regulator, the JFR regulator gives you ± 1 volt band, 20% range of regulation, easy control adjustment on the unit-type control, long-life contacts, fully automatic operation and low maintenance. Maintenance is simplified by the unit-type construction. To expose the control, it is necessary only to loosen two bolts and lower the control tank on a guide to a mechanical stop.

And to simplify installation, the JFR regulator is equipped with two jump-proof mounting brackets just like those used on distribution transformers.

1937 — First easily adjustable contact-making voltmeter. The voltage regulating relay has a simple rheostat for making voltage level adjustments and one movable contact for the band adjustment. Not adopted by any other manufacturer till 1950.

1938 — First Unit Control Panel. The first control panel designed specifically for a regulator.

1939 — First unit-type construction. AFR, DFR and JFR regulators employ unit-type construction in which both mechanism and transformer parts are combined in a unit assembly. In the AFR regulator this means 78 fewer bolted connections between tap changer and transformer — 78 fewer bolts to work loose in the field.

1940 — First *Vari-Amp* feature for DFR regulators. This feature greatly increases flexibility of DFR by providing five current ratings instead of the two current ratings obtainable from other types of regulators.

1941 — First with double terminal bushings. Solved problem of location of load and source bushings.

1942 — First with 1% accuracy control circuit.

1943-1945 — WAR YEARS (Development Postponed)

1947 — First Interchangeable Source and Load Bushings. Regulators can be installed to fit in any existing line structures.

1948 — First standard ratings for 2500 kva three-phase regulators. Not adopted by any other manufacturer till 1951.

1949—First thirty-two ⅝% step pole-type regulator. Brings advantages of ⅝% step regulation to branch lines.

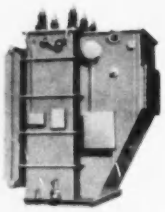
1951 — First Universal 15 kv three-phase regulator. Single unit has flexibility enough to operate over entire range from 11,000 to 14,400 volts. One regulator has more locations on a system.

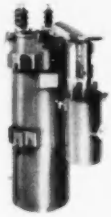
Vari-Amp is an Allis-Chalmers trademark.

ALLIS-CHALMERS

7 Great Features

ALLIS-CHALMERS 5/8% STEP VOLTAGE REGULATORS





		AFR Three phase regulator, sizes through 69 kv, 2500 kva.	DFR Single phase regulator, sizes through 6900 v, 250 kva.	JFR Single phase regulator, 11.4 and 38.1 kva, 7620 v.
1	5/8% Steps	✓	✓	✓
2	Close regulation (±1 volt band)	✓	✓	✓
3	Easy control adjustment. The same type control used on all sizes	✓	✓	✓
4	Close average voltage (maintained by voltage integrator)	✓	✓	✓
5	Long life contacts of liberal design to withstand hundreds of thousands of operations	✓	✓	✓
6	Tapchanging drive mechanism with balanced spring action to eliminate shock . . . operates under oil for long trouble-free life	✓	✓	✓
7	Unit construction to simplify your maintenance requirements.	✓	✓	✓

FOR ALL REGULATION JOBS — from an 11.4 kva regulator on a small feeder to the biggest 2500 kva three phase unit — Allis-Chalmers 5/8% step regulators provide all seven of the quality features checked off above.

That's why you can count on Allis-Chalmers for regulation that helps boost capacity, increase revenue, and improve customer good will.

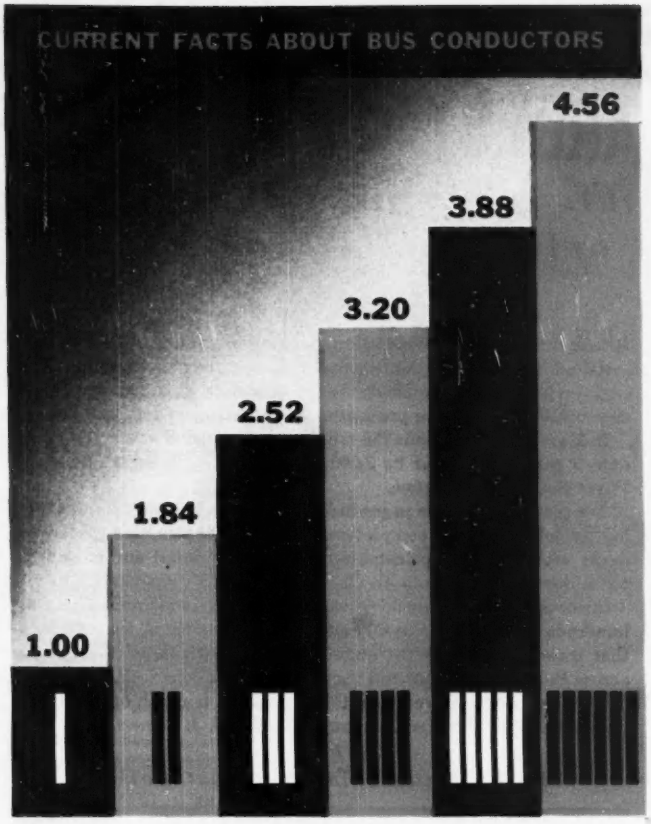
In addition to these important advantages, the single phase 5/8% step regulators require only 1/3 the exciting current of older types of single phase regulators. The low exciting current releases system capacity for useful loads.

Get the complete facts on how Allis-Chalmers 5/8% step regulators can help you from your nearest Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

LITHO. IN U.S.A.



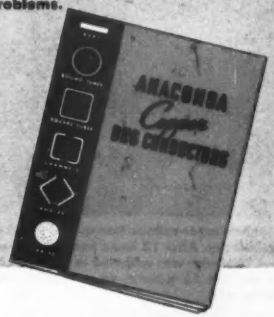
DC capacity of laminated bus cut by inadequate heat dissipation

This diagram illustrates the relative DC capacity in the use of laminated bus bar assemblies. When a number of conductors are arranged in close proximity to form a laminated bus, their DC current carrying capacity is reduced. This is partly because of the obstruction of the free flow of cooling air which reduces the loss of heat by convection. It is also partly due to the screening of the inner conductors which greatly reduces the dissipation of heat by radiation.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement including flat bars, round tubes, channel busses, angle square hollow busses, square tubes and cable conductors. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

free book!

Write today for latest revised edition of the illustrated book, "AnacondA Copper Bus Conductors." It contains a wealth of information about designs and arrangements for bus bars. It may help you solve your bus design problems.



carry the load with ANACONDA bus conductors

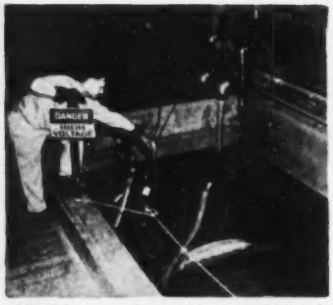
the story of the

WORLD'S LARGEST HIGH VOLTAGE

this is the story of the cable only Okonite could build

Most critical part of any high voltage cable is its insulation. Eight thicknesses of famous Okolite insulation were applied to this cable, by Okonite's exclusive strip process.

Encased in its temporary lead mold, the insulated conductor was "cured" under carefully controlled temperature and pressure.



Okonite's super-voltage testing is the highest in the industry. After 12 hours immersion in water each conductor was subjected to a 170,000 volt d-c test for 15 minutes as well as a 49,000 volt a-c test.

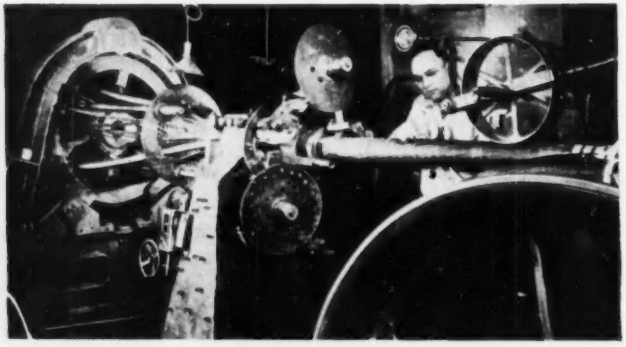
It took three years of cooperative planning from design stage to final installation. Countless conferences between the customer and our engineering staff were made before selecting final cable design, determining methods for production and agreeing on details of laying.

In March, 1951 the giant 7½ mile cable was loaded *in a single piece* onto 9 gondola cars, for its 3,000 mile trip from Paterson, N. J. to Puget Sound, Washington.

The pictures on these pages indicate the infinite care taken in seeing the job through to completion. In spite of its size, this cable was made with the same painstaking attention to detail and exclusive techniques which go into all Okonite cables.

Success of the undertaking was due to the combined efforts of hundreds of people – from Okonite research engineers, the railroads that transported it, to the engineers who triangulated the course across Puget Sound. Because they all did their jobs well, the whole project has been referred to in the press as "a triumph of American ingenuity." The Okonite Company, Passaic, N. J.

The best cable is your best policy

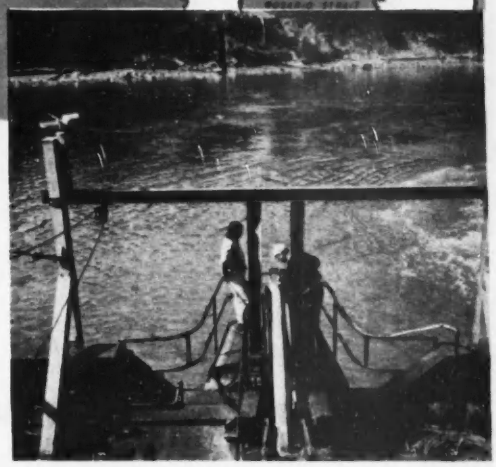


World's largest cabling machine twisted together three half-mile lengths of conductor with cutched jute fillers, then bound them with tape.

OKONITE

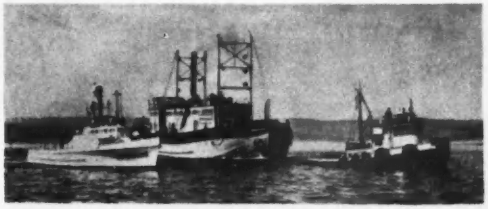
SUBMARINE CABLE

Successive lengths were joined together by skilled splicers, each splice being vulcanized like the original conductor. After a repetition of the high voltage tests the conductors were bound together and covered with a continuous wrapping of steel armor wires.



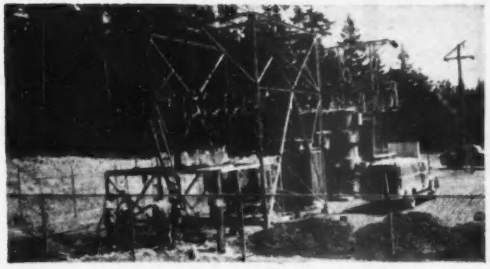
Cable is securely anchored at shore terminal and laying operation begins. Tides and weather records, radioed course triangulation, as well as many engineering details were handled by a competent staff.

In a single length and filling 9 gondola cars, the cable leaves Okonite's plant in Paterson, N. J. Car coupling pins were welded in place, with heavy chains supplementing the coupling.



Escorted by a United States Coast Guard cutter, cable ship played out the cable at a rate of three miles per hour. Despite wind and current, maximum deviation from plotted course was only about 450 feet.

Dockside at Puget Sound, cable is transferred from railway cars over a huge guide sheave. From there it was drawn into wells of the cable laying ship by power capstan and coiled.



Cable was pulled ashore by caterpillar winch to substation, such as this one at Fidalgo Head, and terminated. Just three months to the day after it left New Jersey, cable was energized.

OKONITE SINCE 1878 *insulated wires and cables*

SIGNIFICANT STATISTICS ON STEAM

FOR MILLIONS OF NEW KILOWATTS

CYCLONE FURNACES

At the close of 1951, B&W's revolutionary method of coal-firing had been applied to boilers with steam capacities ranging from 65,000 to 1,200,000 lb. per hr.; design pressures to 2125 psi; and steam temperatures to 1050F. Reheat, pressurized furnaces, and gas recirculation were other features in many of these units. Fuels include Illinois and West Virginia coals, lignite, oil and gas. Total steam capacity of all Cyclone Furnace boilers in service and on order is over **19,000,000 lb. per hr.**

HIGH PRESSURES

Since 1926, when central station boiler design pressures entered the now widely specified range over 1400 psi, B&W has been "headquarters" for high-pressure units. At the end of 1951, nearly 300 B&W natural-circulation units designed for pressures between 1400 and 2700 psi with temperatures up to 1100F, and including the world's largest boilers, were in service or on order. In the field *over* 2000 psi, more than 50 B&W units have been ordered since 1937, and 12 of them are in full-scale operation with outstanding performance records.

Power companies have taken advantage of this unique experience in the range over 1400 psi for an aggregate high-pressure steam-generating capacity of **187,000,000 lb. per hr.**

PRESSURE FIRING

Steadily-growing demand for this advanced principle of boiler furnace operation reflects the confidence of power companies in its demonstrated advantages of higher boiler efficiency, lower auxiliary power, and other significant economies. More than a score of power companies now have in service or on order over 75 B&W Pressure-fired units with a total steam capacity of **51,910,000 lb. per hr.**

GAS RECIRCULATION

Applications of the B&W methods of gas recirculation for superheat and reheat temperature control almost doubled during 1951. Over 75 units employing this feature are in service or on order, with capacities ranging up to 1,370,000 lb. per hr., and with all types of firing. Total steam capacity of all units having gas recirculation is nearly **75,000,000 lb. per hr.**

REHEAT

New B&W reheat boilers ordered during 1951 raised the total steam-generating capacity of B&W reheat units in service, under construction, and on order to over **95,000,000 lb. per hr.**

NEW UNITS IN SERVICE

During 1951, power companies placed orders for B&W boilers aggregating over 60,000,000 lb. per hr. of steam-generating capacity. In the same period, B&W central station units totalling 28,000,000 lb. per hr. were placed in service. The unique experience and advanced steam technology reflected in these and other statistics presented on these pages are good reasons why you will want to draw on B&W's vast wealth of research and engineering know-how whenever you are considering additional power generating facilities. Its broad and diversified base assures you the most considerate and unbiased approach to your specific requirements—an approach essential to the most efficient and economical solution of any modern power problem.

BABCOCK & WILCOX

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET
NEW YORK 6, N. Y.

Facts from
ALABAMA

"'CSP' Transformers save $75.00 per pole on joint-use power line"

"$75.00 each per pole change. $4.00 each in cost of pole. $8.45 per transformer installed. These are the savings we obtained by using 'CSP' Transformers", says an Alabama Utility.

"Here's how we figured it:

"Ordinarily we use 35-foot poles on rural lines. While the Phone Co. was negotiating with us for joint use, we ran into a clearance problem. Conventional transformers would then require 40-foot heights. This meant new poles with change-out cost of approximately $75.00 each. However, 'CSP' Transformers afforded ample clearance on 35-foot poles, avoided the changing job, provided savings in pole cost on the proposed joint lines."

Also installation costs were reduced from $22.45 to $14.00 per transformer.

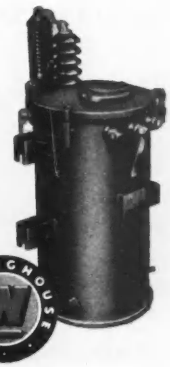
Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

	"CSP"	Conventional
Installation Cost	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse



YOU CAN BE SURE ... IF IT'S

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS

J-70598

For ANY type of electrical conductor ask

ANACONDA

FIRST

HERE'S WHY:

All types of bare and insulated conductors —Copper, Aluminum and Copperweld.

Manufacturing experience.

Metallurgical and engineering skills.

Customer engineering experience and service.

Manufacturing and sales facilities.

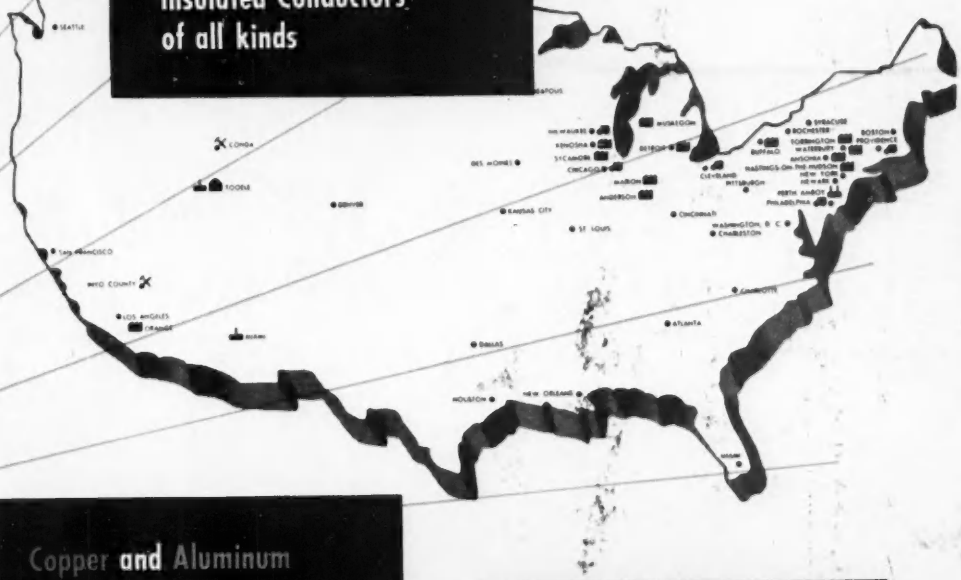
Widespread distribution.

B2470

first in electrical conductors

Copper, Aluminum and Copperweld Transmission and Distribution Conductors

Copper and Aluminum Insulated Conductors of all kinds



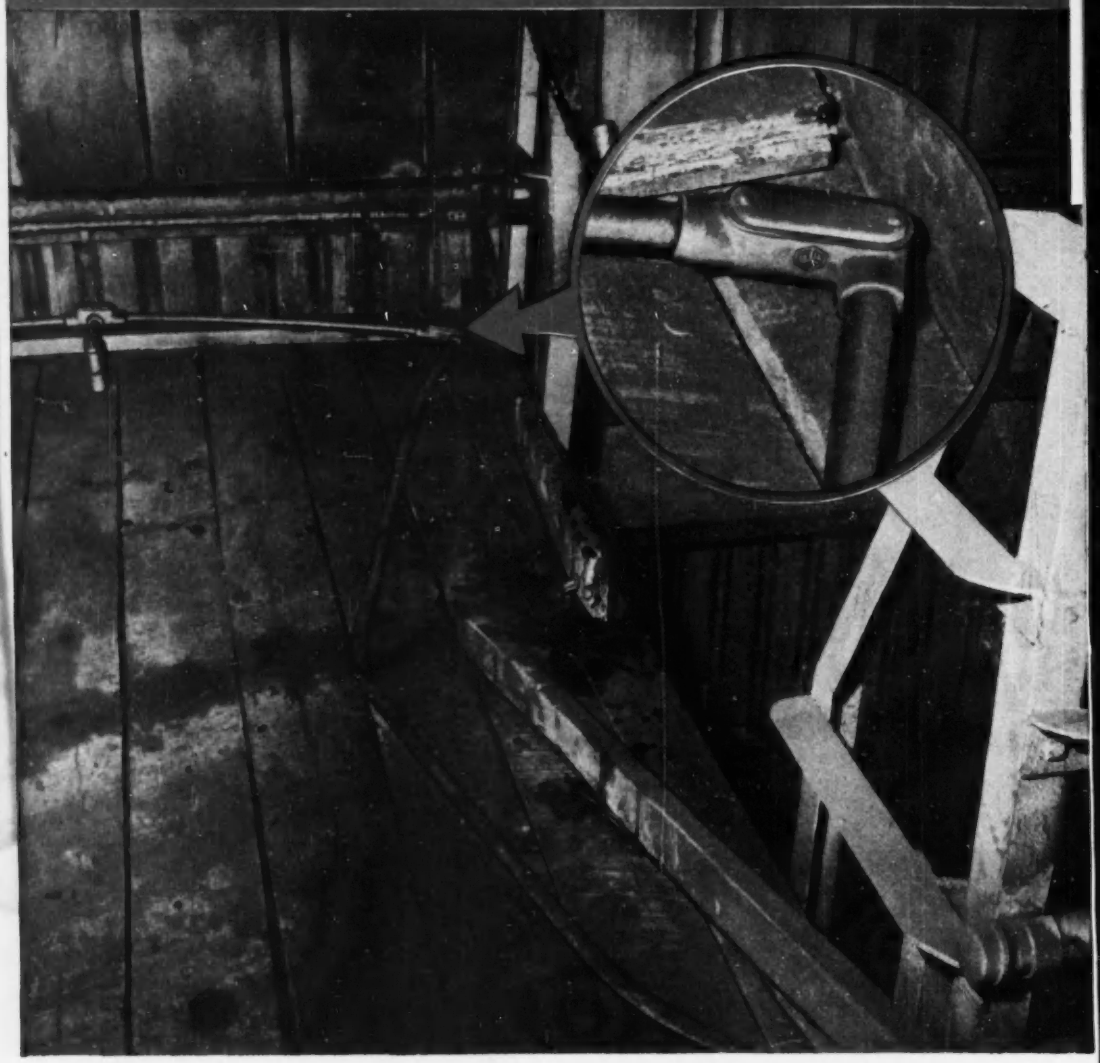
Copper and Aluminum Magnet Wire and Special Conductors

Copper, Aluminum and Copperweld Line Wire and Service Cables

ANACONDA®

ANACONDA WIRE & CABLE COMPANY, 25 BROADWAY, NEW YORK 4, NEW YORK

The CONDULET* and rigid



Photograph of an actual case which proves the protective value of CONDULETS and rigid conduit. In an iron foundry, the conduit was accidentally hit by a heavy bucket full of iron, which bent it 21½ inches out of alignment and exerted a heavy strain on the CONDULETS. The CONDULETS withstood the pressure and there was:

NO distortion of the CONDULET. Cover remained tight
NO interruption of electrical service
NO shutdown
NO lost production

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CONDULETS • TRAFFIC SIGNALS

conduit method gives you the

UTMOST PROTECTION

to electrical conductors

To maintain continuous production, it is important that all electrical wiring be protected against accidental mechanical damage which might result in costly shutdowns. Crouse-Hinds cast Feraloy **CONDULETS** and rigid conduit give you the best possible protection to electrical wiring and equipment.

The illustration at the left is an actual photograph of the kind of accident that is not uncommon in industry. Traveling cranes, electric trucks, or other heavy moving equipment frequently strike the electrical system. **CONDULETS** and rigid conduit can protect your electrical installations from damage by such accidents.

Remember . . . it pays to give your electrical system the protection that is only provided by the **CONDULET** and rigid conduit method.

Other Definite advantages

- **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.
- **FLEXIBILITY.** A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates can be used to make it easy to change circuits or add new ones.
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy **CONDULETS** and rigid conduit . . . the universal wiring method.

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland—Dallas—Denver Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee—Minneapolis—New York Philadelphia—Pittsburgh—Portland, Ore.—San Francisco—Seattle—St. Louis—Washington.
RESIDENT REPRESENTATIVES: Albany—Atlanta—Baltimore—Charlotte—New Orleans—Richmond, Va.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

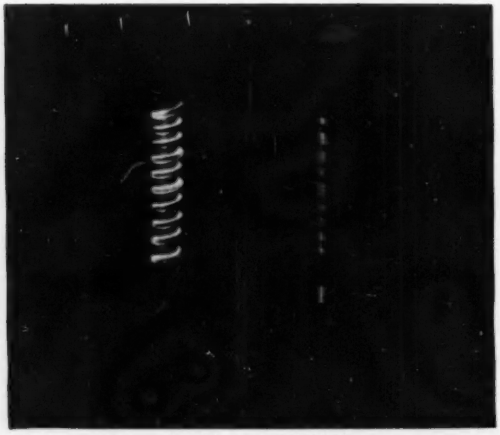
CONDULET
First in the field
STANDARD OF QUALITY

AIRPORT LIGHTING • FLOODLIGHTS

the spike test proves it!

PS Shielding*

American PS Shielded Cables are perfect for aerial lines. Tree trimming is practically eliminated. Corona troubles vanish . . . along with television and radio interference.



Here's a good example of the way PS Shielding prevents corona formation. The conductor on the left is insulated with unshielded "ozone-proof" rubber. But the PS Shielded Cable on the right is completely free from corona.

PS Shielding is so flexible, light and small that it is easy to manhandle over support rigs in the most rugged country.

PS Shielding provides an extra margin of safety when cable must be dragged over sharp rock and when it must be handled by workers.

USS

UNITED STATES STEEL

by itself is a safety measure

***an original development of American Steel & Wire Division**

● There's an easy way to prove the effectiveness of PS Shielding. Just drive a spike through the PS conducting rubber tape into the copper conductor *without touching the ground wires*. Your breakers will trip every time, proving that PS Shielding *alone* is an outstanding safety measure for the protection of all who handle your cable.

Naturally, the PS grounded tapes can't carry heavy currents, so they're usually used in combination with ground wires. But PS Shielding will easily handle the circumferential current of the cable. In other words, it will do everything that metallic shielding will do *with these added advantages:*

Prevents Corona Discharge —PS Shielding is so flexible that it never pulls away from the insulation. This is in sharp contrast to metallic shielding which often separates from the insulation when the cable is bent. Each of the resulting gaps is a serious danger point since it may cause spark discharge plus the inevitable corona and ozone formation.

Easy to Splice —PS Shielding is available in rolls. For most splices you can apply your shielding to the splice just like ordinary insulating tape.

Reduces Bulk —PS Shielding has less bulk and weight than metallic shielding. Consequently, the cables are lighter, smaller, and in general—easier to handle.

Increases Cable Life —PS Shielding is so smooth and pliable that it won't chafe the insulation or jacket. There are no fine wires to break when the cable undergoes hard usage.

For the full story on PS Shielded Cables, get in touch with your nearest American Steel & Wire Division office.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY
GENERAL OFFICES, CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S American Electrical Wire & Cable

UNITED STATES STEEL

Single Phase Detachable Meters

Single Phase Bottom-Connected Meters

Polyphase Detachable Meters

Polyphase Bottom-Connected Meters

Combination Polyphase and Thermal Watt Demand Meters

Polyphase Thermal KVA Demand Meters

Polyphase Switchboard Watthour Meter-Flexitest Case

Polyphase Switchboard Combination Watthour and Thermal Watt Demand Meter-Flexitest Case

Polyphase Recording Differential KW Demand Meters

Polyphase Recording KVA Demand Meters

Polyphase Totalizing Recording KVA Demand Meters

Polyphase Indicating KVA Demand Meters

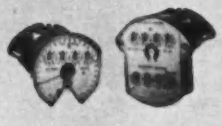
Combination Polyphase and Thermal KVA Demand Meters

Polyphase KVA Demand Impulse Senders

Polyphase Impulse Operated Recording KW Demand Meters

Polyphase Impulse Operated Recording KVA Demand Meters

Single Phase Varhour Meters



Block Interval KW Demand Registers—Indicating and Cumulative

Phase Shifting Transformers

Portable Standard Watthour Meters

Combination Single Phase and Thermal Watt Demand Meters

There's a Westinghouse meter for every application!

Polyphase Recording Demand Meters

Polyphase Switchboard Totalizing Watthour Meter-Flexitest Case

Single Phase Combination Watthour Meter and Time Switch

Impulse Totalizing Relays

Forecasts of unprecedented load growth in the coming years suggest many changes in metering practices. That's why a *complete* line of metering equipment holds an advantage for you. Specifically . . .

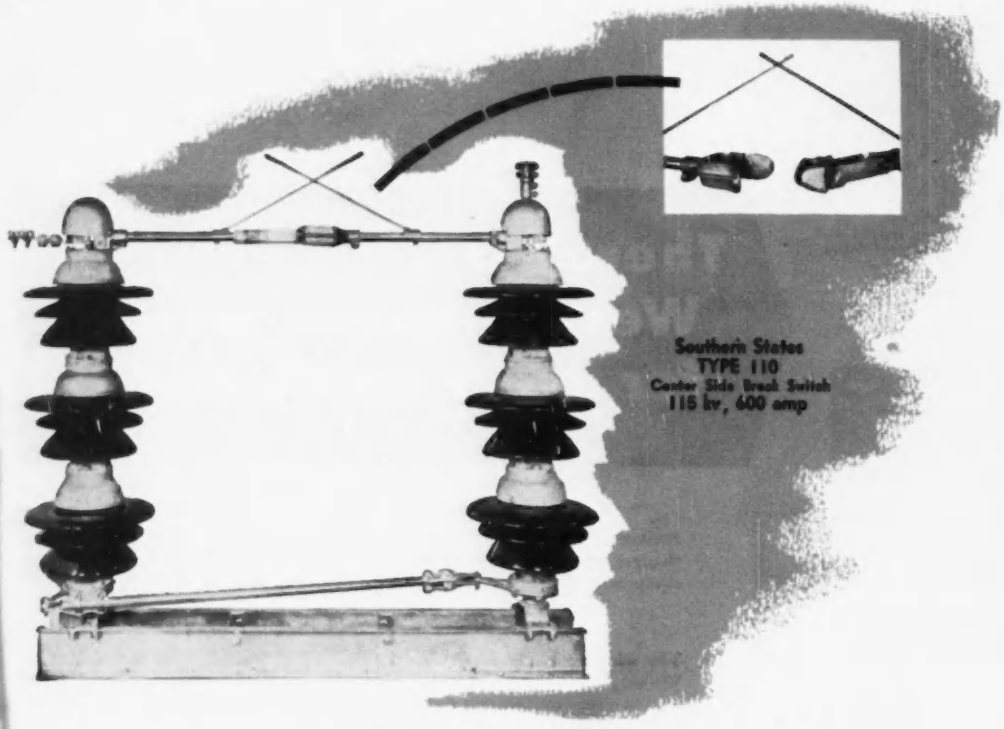
It's assurance that your *future* as well as your present needs can be readily fulfilled.

The wide variety of meters illustrated here is typical of the broad line of Westinghouse Meters offered to you. These and many more types are available to give you low-cost metering for every circuit application . . . three wire, four wire, wye or delta, or totalizing.

To meet your expanding needs Westinghouse has continually pioneered new devices to make the desirable changes in metering methods a practical reality. And you have assurance of dependability because every Westinghouse Meter contains the quality and refinements that result from the engineering of a complete line. So whether your needs involve metering large loads or small, single or polyphase circuits, kw or kva, Westinghouse can meet your requirements.

For more information write for Booklet B-4665. Call your Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40408

YOU CAN BE SURE.. IF IT'S Westinghouse METERS



a stand out

with contacts that stand up

Durability, in the form of rugged, simple construction is built right into the high-pressure line contacts on Southern States Type 110 air break switch. These contacts take rated fault currents, carry rated load continuously, withstand thousands of operations . . . yet perform satisfactorily after years in the field.

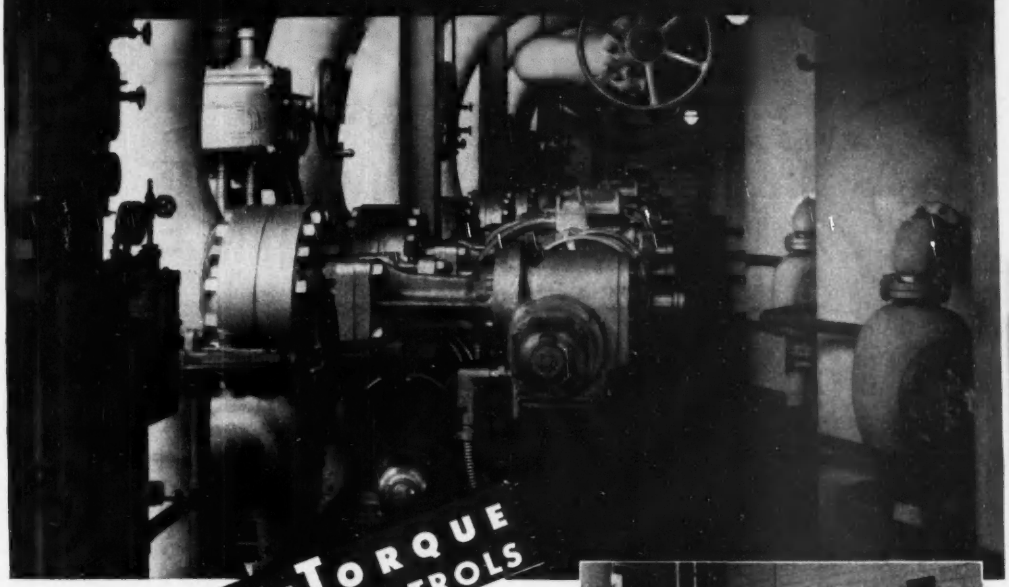
The ageless quality in these contacts comes from a stainless steel spring positioned between contact members and compressed before assembly. An efficient wiping action removes corrosive scale on each switch operation, assuring a clean high-conductivity contact surface. Loss of contact pressure from wear or maladjustment of switch controls is prevented by LIBERAL CONTACT DEFLECTION.

Here's a switch hard to match for wear-life . . . for minimum maintenance . . . for long-range economy.

Write today for Bulletin No. 360-50 for complete information about the Type 110 Air Break Switch.

Southern States Equipment Corp.
HAMPTON GEORGIA

DEPENDABILITY

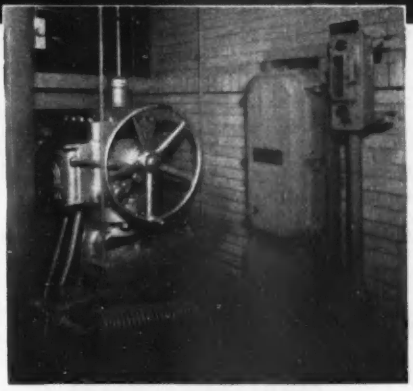


again LIMITORQUE VALVE CONTROLS are the choice

In hundreds of Central Stations, Power Plants, Water and Sewerage Works throughout the world, LimiTorque Controls were chosen for reliability, safety and accuracy.

LimiTorque Remote Control permits one man to operate and to know the status of each valve at a central push-button control station. This is an important safety factor as men are not required to go to high, low or dangerous locations for manual operation. Further, LimiTorque automatically shuts off power should an obstruction occur in closing, thus protecting the valve parts.

LimiTorque is available for all makes and types of valves, and is adaptable to existing equipment. Actuation can be by any available power source . . . electricity, water, gas, oil or air.

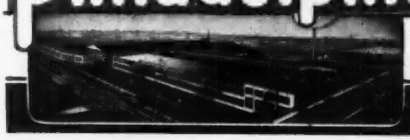


Upper: LimiTorque Control on 1750 lb. feed water valves at heaters.

Lower: LimiTorque Control on a King valve with reversing control and push button station.

Our LimiTorque Catalog is yours upon request. Please write on your business letterhead.

Philadelphia Gear Works, INC.



ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Comptroller finds sure cure for—

HEADACHES DUE TO SKYROCKETING COSTS OF INVENTORY MAINTENANCE

Further "Across-the-Board" Simplification of Materials and Supplies

From Comptroller to Storekeeper, one of today's major headaches is the rapidly mounting cost of maintaining inventories of materials and supplies.

The question is: *"What can you do about it?"*

Many utilities are finding the answer by taking a closer look at their standardization programs. They often find that they can materially reduce the cost of inventory maintenance through further simplification of stocks.

If you're one of these, then Locke can help you.

The industry's ONLY guide to reduced inventory maintenance costs through simplification of Pole Line Hardware stocks.

SIMPLIFICATION MADE EASY WITH LOCKE'S RM* HANDYLOG

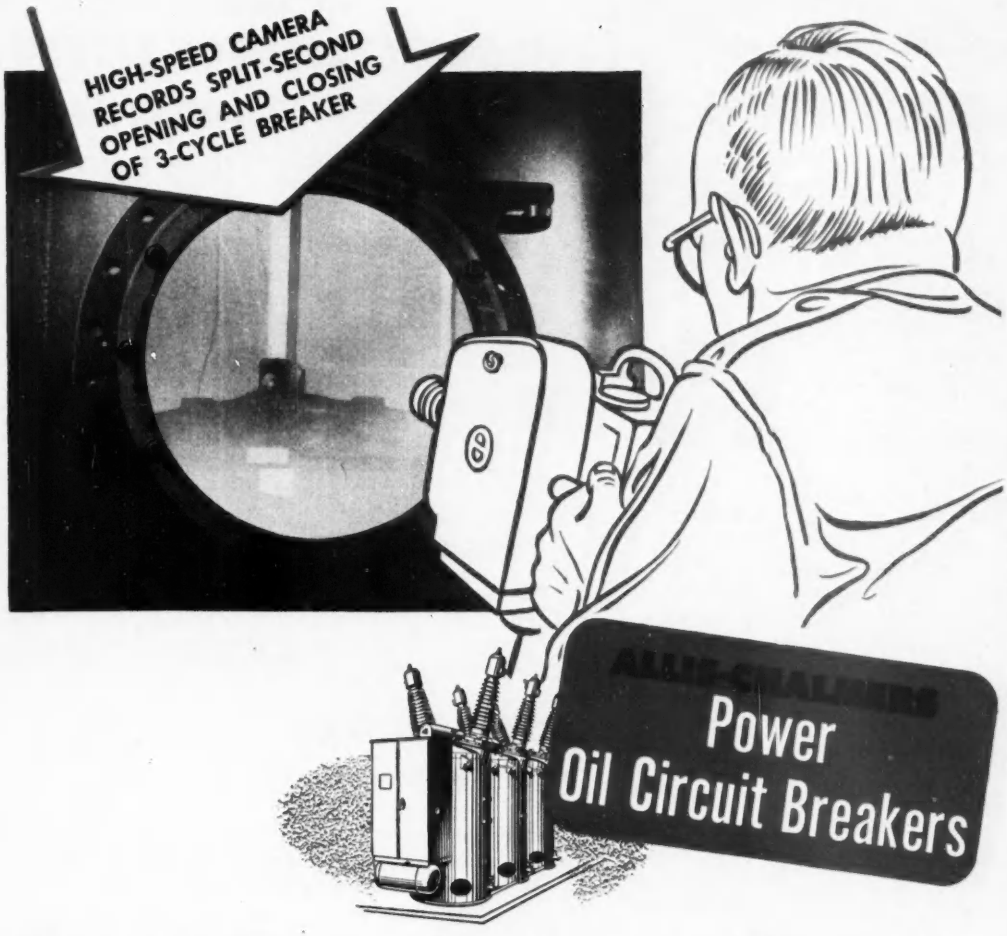
It's the perfect working partner for men wanting to further standardize and simplify their stocks of Pole Line Hardware. It lists ONLY the standard items you need. By using it, you stock fewer items, all fast movers. Each is regularly in production, and carried in stock by your Locke Regional and Distributors' Warehouse. If you haven't got a copy, write for Locke's RM Handylog today. Place the items in it on your standards list. Do this and you'll be taking the industry's only practical short-cut toward further simplification of hardware stocks. Locke Department, General Electric Company, Baltimore, Maryland.

*RM (Repetitive Manufacture) *A program designed to help reduce the installed cost per kilowatt on line and station equipment.*

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Before you buy stop! **See what Locke's Got!**



Positive Protection...

TODAY'S heavily loaded, complex transmission systems require dependable high-speed electrical protection. And Allis-Chalmers circuit breaker engineers are continually developing and testing new designs to provide faster performance and higher interrupting capacities.

Special test equipment permits detailed study of mechanisms in motion, including even the fastest operating parts. High-speed photography, for example, permits contact travel in oil to be recorded through a transparent manhole cover.

Extensive tests are made on each new design — first on separate components, then on the complete circuit breaker. Customer surveys confirm the importance of our emphasis on sound mechanical design and thorough testing.

Get the complete story on Allis-Chalmers circuit breakers from your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3581

ALLIS-CHALMERS

HOW STRONG
should a Bus Conductor be?

CHASE square copper tube buses have high mechanical strength to withstand the forces caused by heavy short circuit currents. They have relatively large cross-sectional areas to give maximum structural strength. This permits longer spans between supports without unduly large sags.

Easily assembled and erected . . . with high thermal conductivity and low resistance voltage drop and power loss per pound of metal . . . these bus conductors are well worth your consideration. Write Dept. EW 152 for the Chase Bus Conductor Handbook.

Chase BRASS & COPPER

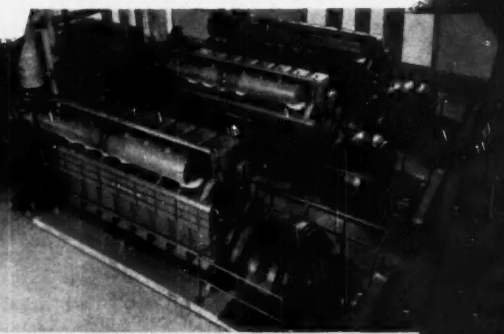
WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

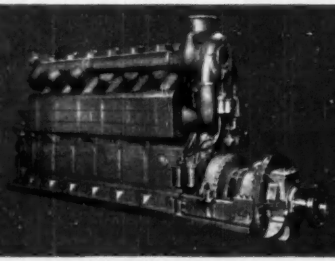
Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(Tmsn office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

How to DOUBLE YOUR HORSEPOWER WITHOUT INCREASING YOUR FLOOR SPACE.....

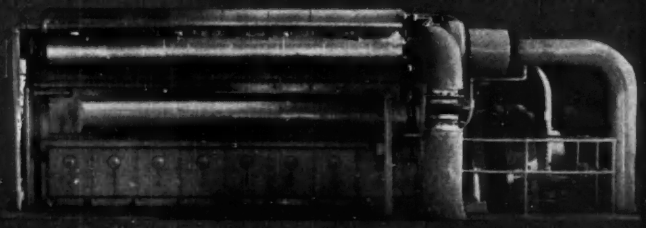
with the NORDBERG *Supair Thermal* Engine



Above: Three 8-cylinder Nordberg FS-138-HSC, *SUPAIR-THERMAL* 1000 kw, 450 rpm generating units at N. V. Overzeese Gas En Electriciteit Maatschappij, an electric utility in Aruba, N. W. I.



Above: Nordberg 6-cylinder FMD-136-HSC, *SUPAIRTHERMAL* engine developing 800 bhp at 300 rpm, for direct drive—direct reversing—propulsion of tugboat owned by Foss Launch and Tug Company, Tacoma, Wash.



A DIVISION OF MORDBERG

NORDBERG

DIESEL ENGINES

Guns and Butter... *Then What?*

Today much of the electric utility industry, operating under "defense-domestic" economy, is faced with conditions which necessitate vigilant future planning if the ultimate goal of all-electric living is to be reached across the country. Hotpoint, with a tradition of close cooperation and understanding of utility problems, has taken the lead in effecting a transition which gradually but surely is bringing complete electrical living nearer reality.

Because of its aggressive promotion of today's low-saturation appliances . . . its leadership in the promotion of all-electric kitchens and home laundries . . . the acceptance it has built for its full appliance line, Hotpoint is maintaining a demand by homemakers for *all* the electrical servants which make up the modern electrical home.

In the days ahead, Hotpoint will have the way paved for still greater utilization of domestic electrical load through avenues of load *balancing*. Hotpoint's Utility Division is at the service of any utility company desiring assistance in developing load-building or load-balancing programs.

Hotpoint Inc.

(A General Electric Affiliate)

5600 West Taylor Street, Chicago 44, Illinois

Here's Why You Get

LOWER HIGH-PRESSURE PUMPING COSTS

with this distinctively new

Class HMTA

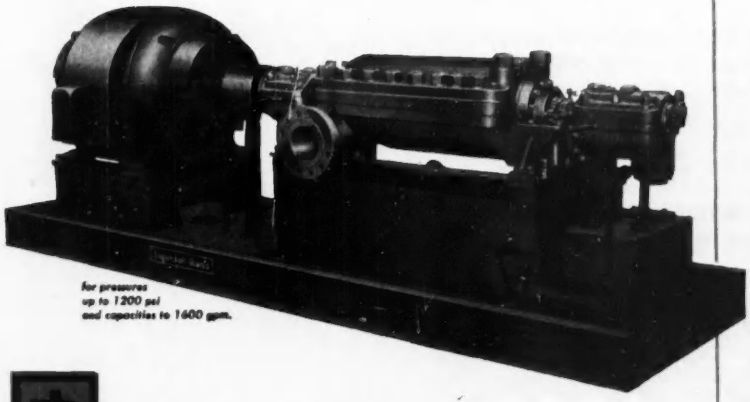
multi-stage centrifugal pump

Check the many distinctive features of Ingersoll-Rand's Class HMTA high-pressure centrifugal pump. See how they all add up to important long-range savings in installation, operation and maintenance. For here is the completely modern answer to the problems inherent in high pressure pumping service—a pump that's designed around the latest advances in hydraulic engineering.

Operating efficiencies stay higher, longer—because all running clearances are proportioned for minimum wear and materials are carefully selected for dependable performance. Maintenance is easier—and there's less of it—with simpler, more rugged construction and greater accessibility throughout. And spare parts inventories are lower due to increased interchangeability between stages.

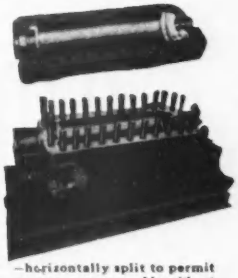
HMTA pumps may be equipped with the Cameron Shaft Seal—and with sleeve or ball bearings, as desired.

Your nearest I-R representative will be glad to give you complete information. Or write for your free copy of Bulletin No. 7233.



for pressures up to 1200 psi and capacities to 1600 gpm.

STRONG, SMOOTH-BORE CASING



—horizontally split to permit access to rotor assembly without disturbing piping connections.

UNIT-TYPE ROTOR ASSEMBLY

—including impellers, wearing rings, and stationary channel rings with interstage liquid passages. All elements self-aligning, all precision-machined for high sustained efficiency.

POSITIVE INTERSTAGE SEALING

—at all temperatures and pressures is provided by corrosion-resistant, metallic rings which form the fit between channel rings and casing. These rings form the most efficient, practical seal yet devised, contributing to the higher efficiency of the HMTA.

MULTIPLE-VOLUTE DESIGN

—assures complete radial balance of impellers over entire range of pump operation.

These and many other new HMTA features add up to:

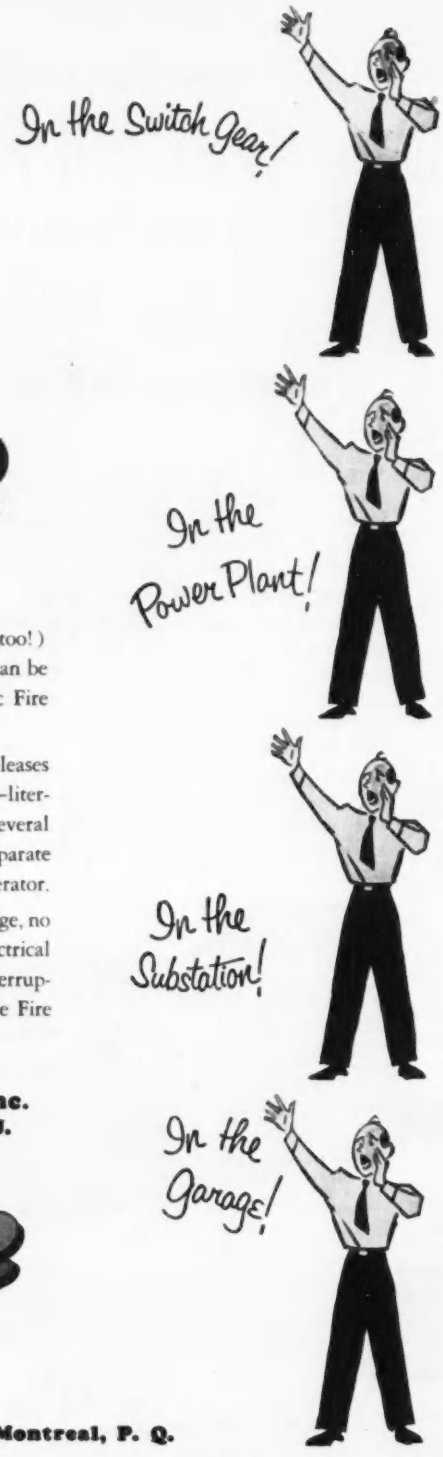
- GREATER DEPENDABILITY
- HIGHER SUSTAINED EFFICIENCY
- LOWER MAINTENANCE COST

Ingersoll-Rand
CAMERON DIVISION 698-10

11 BROADWAY, NEW YORK 4, N. Y.

CONDENSERS • PUMPS • COMPRESSORS • ROCK DRILLS
AIR & ELECTRIC TOOLS • GAS ENGINES • DIESELS

WHERE'S THE FIRE?



There are danger spots in every building (yours, too!) where fire is most likely to strike. These spots can be guarded day and night by a Kidde Automatic Fire Extinguishing System.

At the first sign of flame the Kidde system releases carbon dioxide (CO_2) which blankets the fire—literally smothers it instantly. You can protect several spaces with a single Kidde system . . . or have separate protection for such hazards as a dip tank or generator.

With a Kidde System, there is no water damage, no messy residue to ruin costly machinery, electrical equipment or documents. And that means no interruption in production. Find out more about Kidde Fire Protection today. Write to:

Walter Kidde & Company, Inc.
130 Main Street, Belleville 9, N. J.

Kidde

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Amcreco CREOSOTED POLES

1 **INCREASES LIFE EXPECTANCY OF YOUR LINES** Carefully selected, naturally strong timber is scientifically pressure treated the entire length to produce poles of highest strength and durability. Service records showing from 25 to 40 years of useful pole life prove the long life expectancy of Amcreco creosoted poles.

2 **LOWERS INITIAL COST . . . REDUCES MAINTENANCE EXPENSE**—Poles of practically constant strength promote pole line economy. Smaller sizes and longer spans are possible . . . a lower factor of safety can be allowed . . . lines stay up longer . . . fewer replacements of poles and cross arms are required.

3 **GIVES DEPENDABLE SERVICE UNDER SEVEREST CONDITIONS**—Lines constructed with Amcreco poles are planned for the future. Built for permanence and dependable service under all conditions, Amcreco creosoted poles provide greater long-term economy.

Get the whole story about long lasting, money saving Amcreco poles. Ask for detailed information on actual service records. Write today.

Amcreco
Lowry Process
Creosoted Products

AMERICAN CREOSOTING COMPANY
INCORPORATED
COLONIAL CREOSOTING COMPANY
AMCRECO
GEORGIA CREOSOTING COMPANY
LOUISVILLE, KENTUCKY

In Wilkes-Barre, Pennsylvania:

CONVERSIONS TO TROLLEY COACHES RESULT IN 5-12% RIDING INCREASE

Wilkes-Barre Transit Corporation's modernization program, begun in 1939, has resulted in improved service, increased riding. In the twelve years since conversion, modern efficient trolley coaches have played a key role in Wilkes-Barre transit progress.

Wilkes-Barre's original 17 trolley coaches, placed in service 12 years ago, are still in service, still making money. Since the Wilkes-Barre Transit Corporation's modernization program was begun in 1939, an additional 51 trolley coaches have been added to the fleet. Public acceptance has gone hand in hand with each decision by the Wilkes-Barre Transit Corporation to convert lines to trolley coaches. After each conversion, riding increased 5 to 12% on the modernized line.

Along with passenger acceptance, management's appreciation of trolley-coach reliability, low operating costs and simplified maintenance has contributed to the growth of the fleet. *General Electric Company, Schenectady 5, New York.*

Here are the latest available figures in the Wilkes-Barre story of trolley-coach profits:

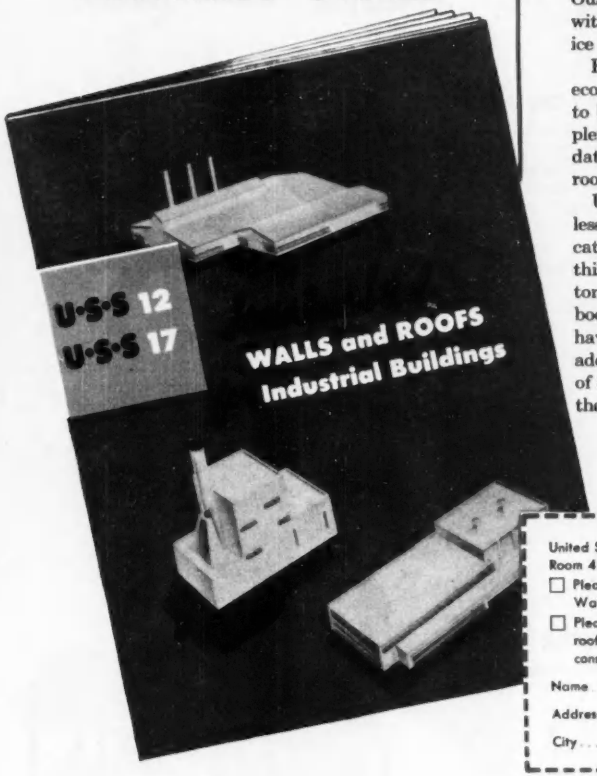
NET PROFIT PER REVENUE PASSENGER		
	Gas Buses	**Trolley Coaches**
Total Revenue	.0987	.1006
Total Expenses	.0927	.0809
Net Profit	.0060	.0197

GENERAL ELECTRIC

Here's the full story

on today's most practical wall and roof material for power plants and other buildings . . .

U·S·S 12 and 17 STAINLESS STEELS



THIS NEW BOOKLET gives you complete details on one of today's most promising developments in industrial construction. It describes fully the use of U·S·S 12 (Type 410) and U·S·S 17 (Type 430) Stainless Steels in the roofs and exterior walls of all types of industrial structures, including power plants and other utility buildings.

Both these Stainless Steels are available for use now. Containing no nickel, they are unaffected by shortages that limit the use of some grades of Stainless Steel. They can be used for buildings you are planning to construct in the immediate future.

Use of these grades of Stainless in industrial construction is not a new development. Our booklet shows you buildings covered with these materials that have been in service more than a quarter of a century.

Factual cost comparisons illustrate the economies of this type of construction, due to longer life, lower maintenance and simpler installation. Here you'll find valuable data on installation of Stainless walls and roofs, as well as suggested specifications.

United States Steel *produces* U·S·S Stainless Steel sheet and strip. It does not fabricate them into formed roof and wall panels; this is being done by a number of our customers. We'll be pleased to send you our booklet, and, if you wish, will arrange to have our fabricating customers send you additional literature on their particular type of Stainless Steel wall and roof panels. Use the coupon below.

United States Steel Company
Room 4335, 525 William Penn Place, Pittsburgh 30, Pa.

☐ Please send me your booklet "U·S·S 12, U·S·S 17 Stainless Steel Walls and Roofs for Industrial Buildings."

☐ Please arrange to have fabricators of Stainless Steel wall and roof panels send me literature on their particular type of construction.

Name ..... Title .....

Address .....

City ..... State .....

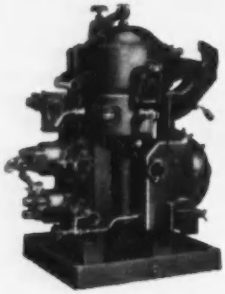
U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE . . . . COLUMBIA-GENEVA STEEL . . . . NATIONAL TUBE . . . . TENNESSEE COAL & IRON
UNITED STATES STEEL SUPPLY, WAREHOUSE DISTRIBUTORS . . . . Divisions of UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-138A

UNITED STATES STEEL

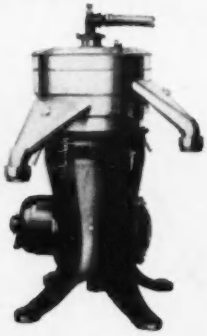
A DE LAVAL CENTRIFUGE for EVERY PURIFICATION NEED...



"UNI-MATIC" OIL PURIFIER

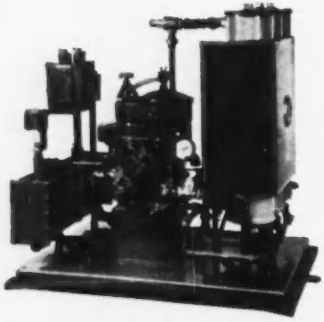
The De Laval "Uni-Matic" Oil Purifier is a completely self-contained unit that includes Purifier and pumps, heaters when desired, gauges, sampling cocks, etc. They are integral oil purification units that are piped ready to connect to inlet and outlet oil and waste water discharge.

Available in several sizes.



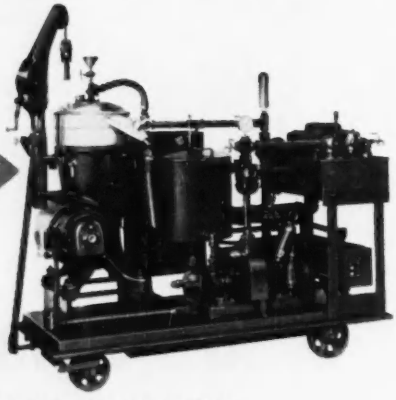
INDIVIDUAL OIL PURIFIER

Like the "Uni-Matic" machines, the individual Oil Purifier is furnished with the De Laval constant efficiency type of bowl, insuring a uniformly high separating efficiency throughout the length of the run. These machines are used where the power plant operator prefers to use existing pumping equipment and detached heaters.



DE LAVAL "PURI-FILTER"

The De Laval "Puri-Filter" combines centrifugal purification with filtration, thus providing the ultimate in oil purification. Flyash, carbon or other very small contaminants of turbine or diesel lubricating oil are removed as well as the more harmful larger impurities. The "Puri-Filter" both purifies the oil and restores its color.



INSULATING OIL PURIFIER

The De Laval Insulating Oil Purifier restores the dielectric strength of the oil in a single pass through the machine. It is the safest of all methods of purifying transformer and circuit breaker oil, for the continuous discharge of water prevents re-contamination of the dehydrated oil.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL **OIL PURIFIERS**

PROTECT YOUR POWER EQUIPMENT

Always look for

R&IE

The "Hallmark" of Quality

"Made by R & IE"—the finest than can be said about any switch.

R & IE Leadership is a three-point program of advancement—1. Progressive Design. 2. Consistent Manufacturing Quality. 3. Customer Cooperation. The trademark R&IE represents years of engineering achievement plus safe, economic and reliable service.

With the change of name as shown below, R & IE Leadership will continue with the same skill and know-how that has brought complete customer satisfaction in the past. Always look for the R & IE trademark—"the Hallmark of Quality".

R&I E EQUIPMENT DIVISION

OF I-T-E CIRCUIT BREAKER COMPANY

GREENSBURG, PA.

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

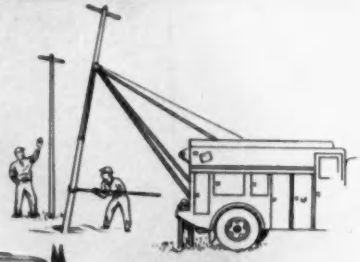
TESTING DEVICES

for every type of utility work—

HOLAN Utility Bodies

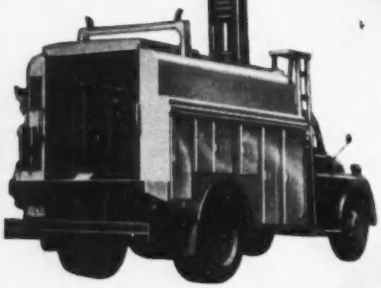
• No matter how specialized your construction and maintenance work, a Holan utility body will meet your needs.

Today, more utility companies than ever before are demanding Holan bodies for two important reasons. First, the wide selection of standard body models often eliminates the need for more expensive special bodies. Second, Holan bodies have many extra features, included as standard equipment at no extra cost, that assure more efficient operation for your crew every working day.



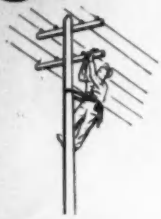
Hydraulic Towers

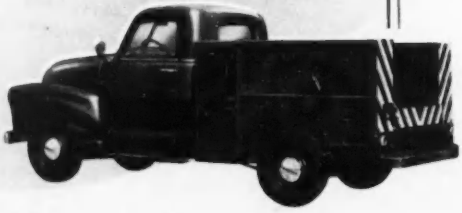
Holan heavy duty hydraulic towers are available with stationary, rotary or transverse platforms and can be mounted on many body models. Operation of the towers is completely automatic. Platforms can be elevated to 30', lowered to approximately 10' 3".



Line Construction Bodies

Holan construction and maintenance bodies can be mounted on any chassis with CA dimensions from 60" to 120". All models are available with or without crew compartments. Model CLC-138 is shown above.





General Service Bodies

Model 1090G is shown at right. Other models with open top, low roof enclosure or high roof enclosure are available for chassis with ½ ton to 1½ ton rating.

The dependable name in Utility Bodies . . .

J. H. HOLAN CORPORATION

BODIES and ACCESSORIES for UTILITIES

4100 West 150th Street Cleveland 11, Ohio

DISTRICT SALES REPRESENTATIVES

2754 N. 92 St. Milwaukee 10, Wis.

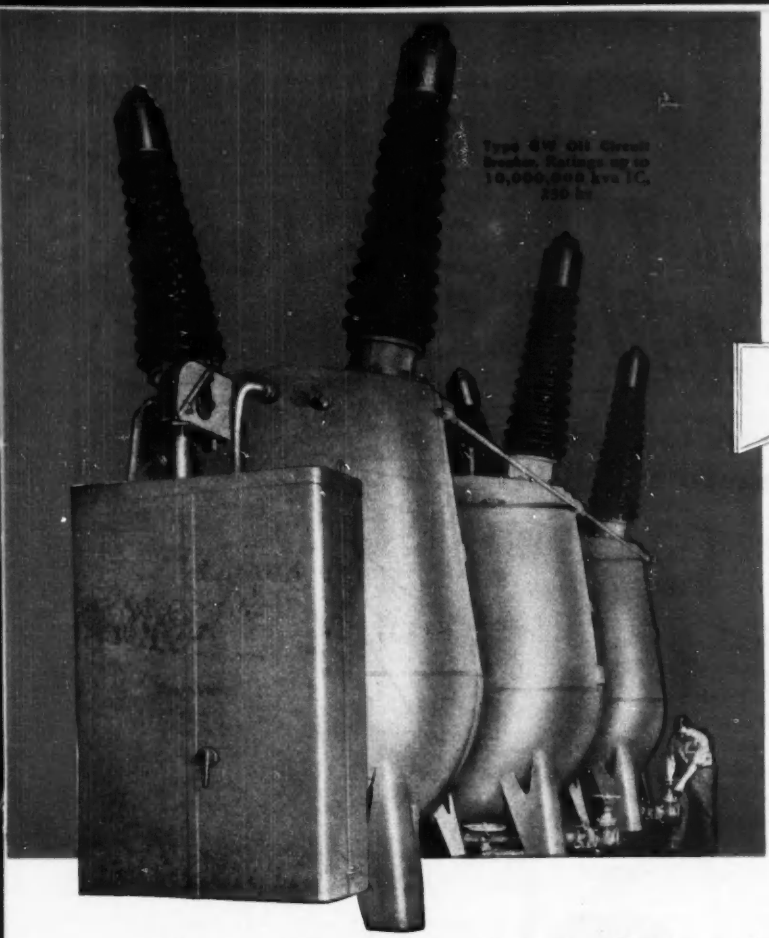
6-03 161 St. Beechhurst Queens, N. Y.

DISTRIBUTORS

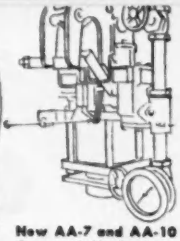
Baker Equipment Engineering Co. Summit and Norfolk Streets Richmond, Virginia

Baker Equipment Engineering Co. 2401 Hutchinson Avenue Charlotte, N. C.

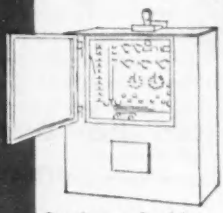
Schetky Equipment Corp. 1810 S. E. 10th Avenue Portland 14, Oregon



Bushing-Type Current Transformers—up to twelve per breaker

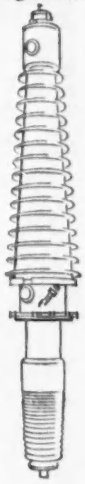


New AA-7 and AA-10 Pneumatic Mechanisms are mechanically trip-free—give 20-cycle reclosing or faster



Condenser Bushing Potential Device—low-cost voltage for instrumentation and relaying

Type MF Multi-Flow De-ion® Grids provide speedy, efficient arc interruption



Type O Condenser Bushings cushion and absorb electrical shocks

New GW "Watchcase" Breaker

SLASHES Oil Requirements!

ANOTHER WESTINGHOUSE HIGH POWER LABORATORY DEVELOPMENT

This Type GW "Watchcase" Breaker, is another example of how Westinghouse High Power Laboratory testing creates new benefits for *you*. Look at these cost-saving features:

- Reduced oil content—roughly one-half of quantity used in conventional breakers.
- Reduced space requirements—minimum floor space and headroom.
- Reduced foundation costs—smaller size, reduced weight allow for smaller foundation.
- Reduced out-of-service time—less time to handle oil, less oil to filter, less oil handling equipment.

Retains All These Advantages of Conventional Breakers

- Insulation—clearances are as great as in cylindrical tank.
- Safety of dead tank construction.
- Bushings interchangeable with transformer bushings.
- Low-cost bushing current transformers—up to 12 per breaker.
- Low-cost bushing potential devices.

For complete information on the GW Breaker, contact your Westinghouse representative or write for Bulletin DB 33-820. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60761

YOU CAN BE SURE...IF IT'S Westinghouse

DE-ION GRID CIRCUIT BREAKERS

Due to current shortages, it is difficult to build enough new reels to alleviate the present situation. So your immediate help and that of others in your organization, is solicited in returning—as soon as possible—all empty Kerite reels in first class condition.
This cooperation will contribute importantly to maintaining traditional Kerite service under today's harassing conditions.
Thanks for prompt action. Return address:
The Kerite Company, Seymour, Conn.

KERITE CABLE Kerite Insulation—Your Cable's Best Life Insurance

One Kilowatt Worth 100 Times Its Weight

In the words above, the Electric Power Advisory Committee, headed by E. W. Morehouse, evaluates new capacity as being worth 100 times its weight in critical materials each year. That is, one kilowatt of capacity can be fabricated and constructed with 1/100 as much of these materials as the same kilowatt can supply the power to produce in one year.

A report from Depa on the Electric Power Expansion Program states that, "The process of electrification has already reached the point where it has become irreversible." And the Maybank Committee on Defense Production says, "It is urgent that the 'kingdom' not be lost 'for want of a horseshoe nail.' "

These quotations are not meant to reflect the essential elements of these extremely able evaluations of the power situation but to show how aptly the power supply problems were described for the benefit of laymen in charge of materials allocations.

There seems to be little disagreement among the authorities as to the problems and solutions of the power supply situation. In summary the picture is found to be as follows:

1. Reserve margin in December was 11.5% compared with a predicted 7.8%. This improvement was due to better than average water conditions, curtailed civilian production, delay in defense loads, and some unforeseen diversity between regions.

2. The 30 million kw of new capacity now planned for 1952-1954 is not excessive. If anything it is too small according to the Advisory Committee. A possible deficit in net capability in 1952 and 1953 is foreseen.

3. It is questionable whether new capacity supposed to be installed in 1952 and 1953 can be brought into service in those years. Even if the capacity is installed, the Advisory Committee foresees a poor geographical distribution with a tendency toward surpluses and deficits from area to area.

4. The Maybank Committee expresses doubts as to "whether sufficient allocations of materials are being made for increasing electric-power production capacity." Its report states that, "If this study does nothing more than instill in all who control its programming an understanding of the importance of lead time in the electric power industry, it will have served a useful purpose."

Now so much for the problems, what are the solutions?

1. Everyone is in agreement that adequate allocation of materials and equipment to carry out the present program is essential.

2. The Advisory Committee strongly recommends more realistic scheduling of capacity, speeding up of shipments to shortage areas, and slowing them up to surplus areas.

3. Strengthening and extending interconnections is held to offer some additional assistance.

4. According to the Depa report, "Daylight saving on a year-round schedule offers some attraction but only in certain regions. In the South where power supply is tight, its effect is negligible. In the Northwest over a whole winter season it produces very little assistance."

5. "To some extent the defense authorities may be able to steer the large new defense loads into areas where power can most readily be made available," the Advisory Committee states.

6. Curtailment in load is relatively impossible except in the case of industry. Here the defense industries would have to share in cut-backs.

Perhaps the Electric Power Study of the Maybank Committee states the overall policy that should be adopted. It says, "Those in charge of allocation policy must give due recognition to the vital need for electric power as an essential ingredient in the formula for successful defense mobilization." For as we said in the beginning, "One kilowatt is worth 100 times its weight in critical materials each year."

Put "Sparkle" in Promotion

The electric utility industry is the most modest industry in the United States. No other industry does a better job. None offers its customers better service. None charges so little and gives so much—and in giving so much tells so little of its achievements.

Everyone has heard the expressions: "Blow your own horn," "The creaking wheel gets the grease." And the Good Book admonishes one not to hide his light under a bushel. With such an authority as a guide, why does the utility industry seem to labor under the delusion that it is unethical to publicize one's accomplishments and that it is degrading to use all of the techniques of modern promotion and public relations?

Fortunately, the list of utilities suffering from this delusion grows smaller each year. More and more companies are giving their directors of advertising and public relations the support they need to match the splendid work done by their colleagues in other industries. Some companies even have appointed vice presidents to direct this important work.

It might be wise for all electric companies to make these resolutions for 1952:

To let no opportunity be lost to tell the public of the industry's and company's achievements.

To advertise in all media to the extent finances permit.

To exploit each new generating plant and physical addition.

To point out each contribution in the way of service to customers and the community.

To show the job being done in the defense program.

To broadcast every award won by company or employees.

To put some "sparkle" into promotional activities.

If your answer to all these is "we do," the next time you play golf with a friend in some other industry ask him about his public relation activities. Compare the manpower budget, amount of publicity received with yours. You might be surprised.

The industry has the right to boast that every year is a year of increased achievement. But let's make 1952 a year for "Sparkle" in promotion.

Add the New but Keep the Old

Most of the nation-wide agencies confronted with resuscitation from asphyxiation, drowning, and electric shock have suddenly abandoned the Schafer prone-pressure method in favor of the Holger Nielsen method. They did so because it adds to the prone back-pressure technique one of lifting the arms so as to provide positive means of inducing air into the lungs—a function lacking in the long-standing Schafer method. Naturally the electric utilities should be and were reluctant to "get on the bandwagon" until there was ample evidence that as many lives could be saved as they had established could be saved by the Schafer method. Nor were they assured that enough recognition had been given to the difference in physiological effects of electric shock on the lungs and heart from those occasioned by submersion or gas.

So the plan is now to let the utilities' medical advisors clear up these technical points and thus set the pattern for a definitive decision by the electric utility industry.

It is not at all unlikely that approval will ultimately be given to the Holger Nielsen technique. A real question not to be overlooked is whether to retain activity in the Schafer and Oesterreich (pole-top) methods. The virtue in that would be that utility crews would be in a position to apply whichever method is most appropriate under the specific conditions of each accident they encounter. The Schafer technique might conceivably be safer to apply, from the standpoint of doing further physical damage, in instances where there were broken arms, shoulders, collar bone, or even spinal injury. In the assured absence of such existing damage the superior air movement attributed to the Nielsen method might well be chosen. Naturally the Oesterreich method should be retained for pole-top cases for which the Nielsen method is not adaptable.

A three-way preparedness would put the utilities in an advantageous position relative to the other groups. In fact those others may some day regret the haste in which they cast aside a technique of proven merit and one that may be the right one to apply under a fair proportion of the cases where artificial respiration is needed.

Older Steam Plants Still Have Value

To most experienced utility operators the value of maintaining older steam plants for peaking service may seem self-evident. But in recent commission proceedings in New England this practice has been challenged by the presiding member. A new station with a single unit and 64 employees generated 331 million kwhr at the cost of 4.8 mills per unit. An older plant with 52 employees turned out 24.6 million kwhr at 26 mills. Another old plant with 114 employees produced 66 million kwhr at 21 mills. Some of the older equipment went into service 35 years ago.

The question arose as to why the older plants were not retired in favor of purchased energy from interconnecting systems. The chief criticism was the high cost of fuel and labor for the older plants. The company seeking a rate increase fully recognized the differential but pointed out that:

1. These older plants cost perhaps half as much per kw of capacity as present day units.

2. Service responsibilities to the public imperatively demand maintenance of these stations in "hot" condition to meet emergencies.

3. River flows at company hydros cannot be counted on to deliver adequate blocks of power throughout the year to conform to load requirements.

4. Neighboring systems facing expanding demands are not adding new units in times like today's for any purpose except to carry their own firm loads with adequate reserves.

It was shown that as modern units are added the company's use of older stations is reduced until the cycle of growing demand forces them into peak production once again. The case for old units under specific conditions is still good.

THE ELECTRICAL WEEK

Featured in the News

Truman asks Congress for $1 billion to finance public power during fiscal '53 (p 114-115) . . . **Washington** intends to increase electric capacity in U. S. 40% above 1951 capability during mobilization period, Charles E. Wilson tells AIEE general session (p 116) . . . **EEI Accident Prevention Committee** will ask medical experts' opinion before adopting Nielsen resuscitation method (p 117) . . . **Depa asks class I utilities** to list their third quarter controlled material requirements (p 117) . . . **I. C. Steele** wins 1951 Kwhr Power Generation Pool with an answer that is 99.991% right (p 117) . . . **Sale of WWP** by American Power & Light to PUD's is delayed as SEC opens hearings on sale proposal today (p 118) . . . **Rain, wind, and snow disrupt service** in Pacific Gas & Electric Co's area in northern California (p 120) . . . **C. B. McManus emphasizes** need for training employees for the future at Industrial Relations Conference (p 120).

• • •

Washington—Power conservation order for the Pacific Northwest will stand until danger of low water conditions passes or until it automatically expires March 31, Depa says . . . Rural electric co-ops will soon begin a campaign to step up use of electricity as a means of increasing farm production . . . Federal thermal power plants for Pacific Northwest will get a turndown from Congress unless the international situation worsens . . . Army Corps of Engineers will place the fourth generating unit at its Wolf Creek power plant on the line in mid-February . . . Plans for a $5 to $6-billion expansion of nation's atomic energy program over next five years are being discussed by Congress . . . Eugene M. Zuckert, assistant Air Force secretary, has been named to replace Sumner T. Pike as a member of AEC.

Utility observers say SEC's notice for hearing today (Jan. 28) on American Power & Light's proposal for sale of Washington Water Power to Public Utility Districts may represent first step in SEC action for involuntary dissolution of American and appointment of a trustee to replace Howard L. Aller as active head of American under Section 11 (d) of Public Utility Holding Company Act.

USBR announces that Folsom powerhouse, near Sacramento, Calif., to be completed in 1954, will be semi-underground. Its three 74,000-hp turbines will be set below present river bed and water will leave in a deep tail race channel, excavation of which has already started.

Army Corps of Engineers is studying a revised plan for development of power at Niagara drawn up by its district and division offices. Tentative plan envisions an installed capacity at proposed Lewiston plant below the falls of 1.3 million kw at a total initial cost of $268.5 million. FPC's 1949 plan proposed an installed capacity of 1.2 million kw at $308-$350 million cost.

Melting snow in the Rockies this spring is expected to send 15 million acre-ft of water down the Colorado River to Lake Mead in largest anticipated April-July run-off since measurements were begun at Grand Canyon in 1922, Bureau of Reclamation announces.

Utah P&L and Telluride Power join in petition to Utah State Supreme Court for a writ of review of a Utah PSC order issued last November that forced Utah P&L to sell electricity to the community of Nephi, which is outside of its franchise area rather than through Telluride Power . . . Federal District Court will be asked to rule on whether Rural Electrification Administration and Southwestern Power Administration have exceeded their legal authority in combining to build generation plants which would compete with Kansas City P&L and nine other companies in Missouri area (EW, Dec. 24, p 11).

Beginning with second quarter, there is no longer any distinction between covered and bare aluminum in the Controlled Materials Program. All aluminum conductor ordered by utilities for minor requirements must bear the H-4 allotment symbol and aluminum content must be charged against minor requirement allotments.

Draft boards will be able to defer apprentices under President Truman's recent order. The apprentice should have been in training for a skilled job for at least a year, unless the trade is on the Labor Department's list of "critical occupations." In that case, he need have been in training only six months.

Chicago Federation of Labor has appealed a constitutional provision advocating municipal ownership and operation of city's gas, electric, and telephone systems, on the books since 1896. Federation's Pres William A. Lee said, "We are against nationalization of industry, against this local form of socialism. We are for private enterprise from top to bottom."

South Carolina E&G gets PSC approval to increase rates by $1.3 million annually, effective Feb. 1 . . . British Columbia Electric asks for third rate increase in year. It would boost second step of residential rate for 200 kwhr from 2¢ to 2.5¢ per kwhr.

Duke Power asks North Carolina PUC approval to sell certain of its facilities to City of Gastonia for $220,630 . . . Central Illinois E&G plans to offer 64,000 shares of common stock to stockholders on 1-for-10 basis and also proposes to sell $4 million bonds, competitively, in Feb. 1952.

Congratulations—Connecticut L&P elects R. G. Ely, vice president in charge of sales, and A. S. Jourdan, vice president in charge of public relations . . . Dr H. L. Hazen, head of electrical engineering department of Massachusetts Institute of Technology since 1938, becomes dean of Institute's Graduate School next July.

WASHINGTON COMMENT

JESSE MOCK

Don't look for any rush to set up an Office on Electric Power within the mobilization agencies.

Creation of the office was recommended by the Joint Congressional Committee on Defense Production (EW, Jan. 21, p 10). Main purpose would be to help solve material allotment and procurement problems, which have been hounding the utilities ever since controls were invoked.

The committee purposely avoided any explicit instructions as to how the proposed office would be organized or under what agency it would be placed. It gave no hint that it was thinking of an electric power czar but made clear the office should have sufficient authority to see that allocation tickets could be honored promptly.

This vagueness on the part of the committee will contribute to the sidetracking of the recommendation. If the committee had a clearer idea of what it wanted, it would have a better chance of getting it.

Headed for the Mothballs . . . But there is a more obvious reason why the recommendation will end up in mothballs—probably for good. Creation of an Office on Electric Power would center material control authority for this vastly important industry in one governmental department. This would upset the delicate balance of power that now exists between the Commerce Department and the Interior Department.

At present Interior's Defense Electric Power Administration is claimant agency for the utilities, but Commerce's National Production Authority claims materials for the electrical equipment manufacturers. In the Washington tradition both these departments are jealous of their authority and would not willingly surrender a particle of it. Furthermore, both would be able to point out that the power program is suffering less under the divided authority than some other industry programs are under a single authority.

As the Congressional report pointed out, some steps are already being taken to coordinate material allotments and procurement for the power expansion program. The NPA divisions have set up scheduling-expediting sections with an eye to alleviating the problem. Also, there has been informal coordination of the quarterly material requests submitted by the three agencies most intimately concerned with the power program. These include Depa along with NPA's Electrical Equipment and Engine and Turbine Divisions.

Neither Interior nor Commerce Will Surrender . . . One observer who is thoroughly familiar with the undercurrents which shape mobilization policy called the recommendation "an impossibility—at least for the time being." He cannot conceive of either Interior or Commerce giving up their prerogative in the power field. And even if the top officials in Washington were willing, there would be plenty of opposition from underlings and outside interests.

For instance when the rumor went out last summer that Depa would be moved to either NPA or Defense Production Authority, some rural electric cooperative leaders immediately began a counter move. At least one regional cooperative organization passed a resolution condemning any transfer of Depa from Interior.

In this "guns and butter" economy, there will be no hurry to set up the proposed office. Of course, if an all-out war came, it would be set up surely and swiftly along lines of World War II's Office of War Utilities. The Munitions Board and the National Security Resources Board have a plan in mind for emergency purposes, but it just doesn't adapt itself to the present cold war situation.

Boiled down to its essentials, the situation is simply not desperate enough to call for any drastic steps. Unless Congress shows it means business, the recommendations of its power study may be more ignored than honored.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Linemen have too often too much respect for their own opinion that all treated poles are conductive; are there facts to alter that attitude?

Women are not immune to electric utility accidents; two home service girls were killed in a head-on crash with a crazy driver.

Poles shipped in flat cars have a better chance of being preservative dry than those shipped in gondolas; it is a good idea to unload them early on hot days.

Carbon tetrachloride will extinguish bees and hornets nested in a meter box as well as it does fires.

Gas leaks in gas pressure cable can be located by observing the difference in rate of escape of nitrogen and hydrogen; the rate accelerates when the N-H interface reaches the leak; a flow indicator tells where the interface then is on a time-distance basis.

Agrarian Europe (11 countries) has 19,000,000 households on 280,000 square miles of arable land; electrification of all farms in 40 years at an outlay of 4½ billion dollars will progressively double the acreage per farm and halve the number of farmers.

(Extracts from Stanford Research Institute Report to U. S. AEC on Industrial Uses of Radioactive Fission Products)

Grain infestation is preventable if the material is subjected to relatively low dosages of fission radioactivity.

Permanent ionization in gaseous discharge tubes sustained by radioactivity would undoubtedly improve their performance. Lower voltage would suffice for faster starts.

Static prevention is a prime objective in grinding operations because static builds up on the ground particles and interferes with finer grinding. Beta ray ionization would vitiate the static.

Mold and fungus growth on underground cable sheathing could probably be prevented by ionization through radioactive exposure.

Faster flame propagation would probably result from ionization of the air-fuel mixture by radioactive means.

Weekly Electric Output Good Business Indicator

Output is one of the industry's most frequently misunderstood statistics. Output for the week, reported by the Edison Electric Institute, is officially net energy for distribution. It is sales plus losses—not generation.

Now you may ask, "Why report sales plus losses?" The answer is a simple one. Net energy for distribution, namely sales plus losses, provides an excellent business indicator. Generation, obviously, gives no regional picture, since energy produced in one region is frequently consumed in another.

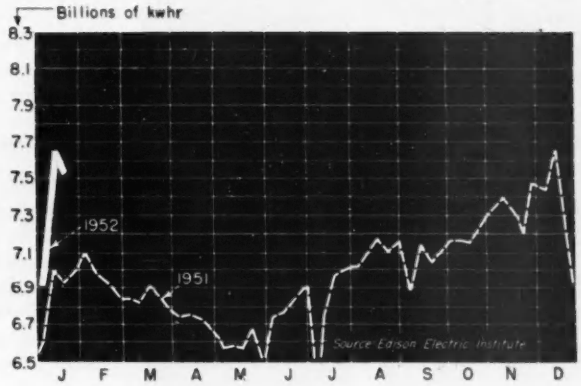
Not only does weekly output provide a week by week picture of the electric utility industry, but it is also a good indicator of business in general.

Each week reports are received by EEI from utilities representing over 90% of the industry's output of electrical energy. Reports for any particular week, always ending on a Saturday, are mailed, air mailed, telegraphed, and telephoned to EEI for compilation and expansion to represent 100% of the industry's output. Final figures are established by 4 pm on Tuesday of the week following the week being reported.

Coal Stocks . . . at electric utility power plants on Dec. 1, 1951 were 39,381,543 tons, highest level on record.

In terms of days' supply, which is based on the rate of consumption for the month of November, there were sufficient stocks of coal on hand to last 122 days as compared to 110 days a year earlier.

Weekly reports of electric output were started by EEI in 1928. Historically, geographic divisions used in reporting output were formed on the basis of type of industry served. Since their establishment there have been only small adjustments in the divisional boundaries. Several regions have, however, been split to form new ones. Latest change in reporting weekly output was made on Jan. 1 of this year. At that time the Pacific Coast region was split into a Pacific Northwest and a Pacific Southwest region. Two reasons were given for the change. The Northwest and Southwest form two separate power pools with no interconnection. Secondly, there is no similarity in types of industry.



Output Week Ended Jan. 19—7,539,879,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid Atlan.	Cent Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Jan. 19	+9.1	+6.1	+7.1	+6.5	+8.3	+10.1	+20.5	+10.2	+11.4	+12.0
Jan. 12	+9.8	+6.4	+7.6	+7.2	+8.8	+11.5	+19.5	+10.6	+11.7	+13.5
Jan. 5	+8.3	+2.6	+6.1	+4.5	+7.6	+ 9.7	+19.7	+10.8	+12.5	+12.8

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load—Class I Utilities (Million Kw)	Nov.	66.00*	63.37	60.03
Capacity (Million Kw)	Nov.	75.18	74.68	67.98
Production (Billion Kwhr)	Nov.	32.10	32.44	29.02
Hydro		8.08	7.55	7.67
Fuel		24.02	24.89	21.35
Sales (Billion Kwhr)	Sept.	27.54	27.45	24.75
Residential		6.82	6.50	5.84
Commercial		4.89	4.91	4.29
Industrial		13.62	13.83	12.66
Other		2.22	2.21	1.97
Fuel Consumption				
Coal (Million Tons)	Nov.	9.72	9.58	8.76
Oil (Million Barrels)		5.95	5.44	6.20
Gas (Billion Cu Ft)		53.70	72.00	47.76
Net Income Class A & B Utilities ($ Million)	Sept.	57.48	53.92	56.88
Dec. 52 Peak Class I Utilities (Million Kw)*	Oct.	77.4	77.2	69.6
Kwhr per Residential Customer (12 Month Average)	Oct.	1,972	1,961	1,801
Revenue per Kwhr Residential Service (12 Month Average)	Oct.	2.83	2.83	2.90
Canadian Production (Billion Kwhr)	Nov.	4.94	4.92	4.46

Business Statistics

FRB Industrial Production Index†††	Dec.	216*	219*	216
Gross National Product ($ Billion)	3rd Qtr	81.7	79.1	72.4
EW 5 Industry Production Index	Dec.	124.0*	123.4*	120.3
ENR Construction Cost Index††	Jan.	114.8	114.8	111.3
BLS Consumer's Price Index	Nov.	188.6	187.4	176.4
NEMA Insulation Materials Sales Index†	Nov.	511	559	542
NEMA Electric Appliance Sales Index (Unadjusted)†	Nov.	269	305	367
NEMA Household Refrig. Sales Index†.	Nov.	87.7	113	228

* Estimated † 1936 = 100 †† 1949 = 100 ††† 1937-39 = 100 (Unadjusted)

PRESIDENT TRUMAN last week asked . . .

Next Year's Federal Power Budget

Agency	Estimated Expenditure Fiscal 1953 (millions of dollars)
Corps of Engineers	$294.0
Interior	
Bonneville Power Adm.	52.5
Reclamation Bureau	124.0
Southeastern Power Adm.	4.0
Southwestern Power Adm.	5.0
Tennessee Valley Authority	244.2
International Boundary and Water Commission	10.3

Expenditures include $32 million from corporate fund.

. . . this much for federal power projects in fiscal 1953

One Billion Dollars for Public Power . . .

. . . is sought by the President. Three-quarters of the amount would be spent directly on building electric facilities

President Truman last week asked Congress for more than three-quarters of a billion dollars to spend directly for construction of electric power projects during fiscal 1953.

Probably another quarter billion would be used indirectly to help finance construction, operation, and maintenance of electric power facilities by the federal government.

In his budget message, the President said he is reducing sharply expenditures "for those programs which can be deferred or eliminated." But he added he was recommending expansion of a number of programs contributing directly to the defense effort "such as . . . projects for the expansion of electric power."

Initiation of construction on four hydroelectric projects was recommended—St. Lawrence Seaway, Ice Harbor lock and dam, Hartwell (Ga.) Reservoir, and Hells Canyon.

With the exception of Hartwell, the President had included all of these in the fiscal 1952 budget. Congress did not see fit to authorize construction of the St. Lawrence or Hells Canyon projects, and declined to provide funds for Ice Harbor because of the fish controversy.

Cost for Four . . . Total estimated cost of the four projects would run more than $1.2 billion. This was slightly under the new program recommended last year, which totalled $1.5 billion.

The President also recommended authorization of thermal electric power plants for the Pacific Northwest, but did not ask for 1953 appropriations for this purpose.

Also requested was $63 million for Tennessee Valley Authority for addition of 11 new generating units to present steam and hydro plants. When installed, it is estimated the new units will account for an increased capacity of 1.3 million kw.

Of the $735 million recommended for projects already underway by the Corps of Engineers and the Bureau of Reclamation in fiscal 1953, President Truman estimated approximately $390 million—or over 50%—would be spent on multiple-purpose projects with power facilities.

Among other things, the President recommended new language which would completely eliminate the Keating Amendment from the Reclamation portion of the appropriations bill. This amendment sought to curb construction of transmission lines by the bureau where electric companies were willing to furnish such facilities.

Although Congress last year sought to cut back the number of personnel in most civilian agencies, the new budget indicates more employees will be needed in most power agencies than before the cut.

Here is an agency-by-agency rundown of proposed fiscal 1953 appropriations:

Engineers' Plans . . . Army Corps of Engineers plans to spend an estimated $294 million on power projects, or

projects with power features. Proposed new starts are Ice Harbor lock and dam, for which $5 million is requested in the '53 budget, and Hartwell Dam in Georgia, for which $4 million is requested. Upon authorization by Congress, it is also proposed the Corps will undertake the construction of the St. Lawrence Seaway with a $20-million supplemental appropriation during the fiscal year of 1953.

A request of $1 million would be used "for engineering and economic investigations pending authorization for construction of projects for development and utilization of the waters of the Niagara." This careful language appears to indicate that the federal government is less sure of constructing the proposed new power facilities in the vicinity of Niagara Falls than of constructing the St. Lawrence Seaway.

Reclamation Requests . . . Bureau of Reclamation is requesting about $13 million less for construction in fiscal 1953 than during the current fiscal year. A large portion of the $195 million requested will go to a few of the projects now under construction: Central Valley, $40 million; Missouri Basin project, $53 million; Hungry Horse project, $13 million; and Colorado-Big Thompson project, $18 million.

The bureau is asking $21,563,000 for the transmission division of the Missouri River Basin project. It proposes to begin initial construction on the Jamestown-Fargo-Fergus Falls-Benson - Granite Falls-Mankato-Blue Earth-Jackson-Fort Randall 230-kv line in Minnesota, South Dakota, and North Dakota. In Montana, the bureau proposes construction of the Yellowtail-Billings 115-kv line.

In Iowa, it hopes to award construction contracts for the Sioux City-Omaha transmission line.

The Canyon Ferry unit of the Helena-Great Falls division has a budget estimate of $4,754,000, compared with $8,905,801 appropriated so far in 1952.

The proposed Hells Canyon project would be built by the bureau when and if it is authorized.

BPA Asks Transmission Funds . . . Bonneville Power Administration requested no funds for the proposed thermal plants, but probably would ask for this in a supplemental appropriation. Among the transmission facilities for which money was requested were the controversial Central Valley-Bonneville intertie, $900,000, and the La Grande-Baker interconnection, $1,173,000. BPA also requested $3,976,000 for transmission facilities between McNary-Big Eddy-Ross, and $7,685,000 for the proposed transmission line between Chief Joseph Dam and Snohomish County, Wash. A number of other smaller transmission lines also are proposed.

Sepa Expansion . . . Southeastern Power Administration is looking forward to a tremendous expansion of activity in fiscal 1953 as more federal hydroelectric projects in its area come on the line. Major portion of its construction requests are to build transmission lines from three dams—John H. Kerr (formerly Buggs Island), Clark Hill, and Jim Woodruff.

Proposed lines tying in with the John H. Kerr Dam would come from Suffolk and Prince Edward, Va.; from the Suffolk Naval Base, Va.; from a connection with Virginia Electric Power Co; from Altavista, Va.; and from Kinston, N. C.

Proposed lines tying in with Clark Hill Dam in South Carolina and Georgia would come from Batesburg; from Aiken and from Hartsville in S. C. and from Augusta, Ga.

Proposed lines tying in with the Jim Woodruff Dam in Georgia, Alabama, and Florida would come from Tallahassee, Fla., and from Wiregrass Electric Cooperative in Alabama. Southeastern is also requesting a small amount to build a connecting line between the Philpott Dam and Appalachian Power Co.

Balked by Congress last year in getting a continuing fund for purchase of electric power and lease of transmission facilities, Sepa this year asked for $500,000 for these purposes. It included the request along with other operation and maintenance expenses.

SPA Ups Request . . . Southwestern Power Administration is asking nearly $1 million more in construction funds in 1953 than it did for 1952. Major portion of the '53 request is for constructing transmission facilities which would interconnect the federal system with the Grand River Dam Authority in Oklahoma. SPA also proposes to build a dispatching and warehouse building at Springfield, Mo.

The agency is asking for $1,425,000 from its continuing fund for the purchase of electric power and rental of transmission facilities, and $1.5 million for operation and maintenance.

Interior Wants Money for Study . . . Interior again asked for $50,000 for a study of electric power and energy in New England and New York—a request which was turned down by Congress last session.

REA Cuts Request . . . Rural Electrification Administration is asking for an additional loan authorization of $50 million for electrification purposes. This is half the amount requested for the present year, but carryovers will permit the approval of loans to cooperatives considerably in excess of the $50 million figure. The reduced request, said the President, is due to material scarcities.

New Hydro Projects Proposed in President's Budget Message

Project	Proposed Capacity	Estimated Date First Power	Total Cost	Funds Requested in '53 Budget
			(in thousands)	
St. Lawrence	940,000	4-7 years	$600,000	$15,000
Ice Harbor	260,000	Dec. '56	102,132	5,000
Hartwell (Ga., S.C.)	180,000	Dec. '56	80,500	4,000
Hells Canyon	900,000	5 Years	433,000	6,000

Federal Power Generation

(Name-plate capacity in millions of kw)

Agency	As of Dec. 31 1951	On Completion of Projects Underway	Additions Proposed in '53 Budget
Corps of Engineers	1.1	7.5	1.4
Bureau of Reclamation	4.3	5.1	.8
Tennessee Valley Authority	2.9	5.9	1.3
International Boundary Commission	...	.1	...
Total	8.3	18.6	3.5

CHARLES E. WILSON, director of defense mobilization, tells AIEE nation is broadening base from which it will produce for all-out war or peace. F. O. MacMillan is at right

40% Capability Hike Slated . . .

. . . by Washington planners during mobilization period, Charles E. Wilson tells general session of AIEE

During the mobilization period, Washington intends to increase electric capacity in the United States 40% above capability at the end of 1951, Charles E. Wilson said last week.

The Director of Defense Mobilization spoke at the Winter General Meeting of American Institute of Electrical Engineers in New York.

Wilson's figure would mean an increase of more than 31 million kw. This is in line with the Morehouse Committee report to Defense Production Administration (EW, Jan. 14, p 76), which stated that an addition of 30 million kw by 1955 would not be enough to handle power needs of the mobilization program and the civilian economy.

Asked to comment on this statement, Wilson told Electrical World, "I haven't had time to dig into the Morehouse Committee Report, but I'm definitely going to. It's a tremendously important part of the whole mobilization picture."

The defense mobilizer told the AIEE general session that more than 7 million kw had been added to the nation's capacity in 1951, and nearly 10 million kw would be added in 1952. Last year's increase—10%—was, he said, "the greatest expansion in a single year in the history of an industry famous for its remarkable advances."

Electrical expansion ties in directly with plans to produce from a much larger economic base than existed during World War II, he indicated.

"We are building a bigger base in terms of electric power, steel, aluminum, chemicals, oil production, and other fundamentals of modern industrialism," Wilson said. "The country will emerge from this intensive period of defense mobilization far better able to wage either all-out war or all-out peace."

In striving to expand the base, he said, mobilizers have in some cases stubbed their toes.

"We have been sorely handicapped," he commented, "by shortages of certain metals, particularly copper. Copper is the red gold of our time. We just haven't got enough of it to satisfy the pressing demands that range from the vital matter of ammunition cases to the construction of huge electric generators. In this and other respects, such as alloying metals, the United States is partly a have-not nation."

The mobilizers, he said, are searching the world to remedy the deficiencies, but meanwhile, the country must resort to substitutions, sacrifice, and restraint.

Wilson urged that in time of peace the nation continue the framework of a mobilization organization, to be administered by the executive branch of the federal government. In such an organization, he said, industry must be allowed to respond and cooperate without being hampered or frustrated. The program, he added, would have to be insured and supported by Congress through advice, legislation and appropriation.

Fred O. MacMillan, president of AIEE, told the delegates the institute was working to evolve an engineering organization that would cut across all engineering lines.

"We want to evolve an engineering unity organization," he said, "through which engineers can contribute to the common good at the local, state and national level."

MacMillan said he thought AIEE has not done enough to tell the public that there is a shortage of engineers. He pointed out that a large-circulation national magazine last month published a story that engineering was overcrowded, suggesting it might be better to steer clear of the field when choosing a profession. The institute, he commented, should do all it can to dispel this idea.

(Technical aspects of the AIEE meeting will be covered in Electrical World's issue of Feb. 11).

•

Safest Year for Utility

Georgia Power Co has just completed the safest year in the history of its operations. Pres Harllee Branch, Jr, stated that during 1951 the company's more than 5,000 employees worked 12,985,560 manhours with only 14 disabling injuries and one fatality. Its previous all-time low was in 1934 with 22 disabling accidents.

Seeks Advice on Resuscitation

EEI Accident Prevention Committee will ask expert medical opinion before adopting Nielsen method

Official medical advice will be sought by the electric utilities before joining en masse the groups which have adopted the Holger Nielsen method of resuscitation. This action was taken by the Edison Electric Institute Accident Prevention Committee at its recent meeting in New Orleans.

The stand taken at the New York meeting in October in favor of awaiting convincing statistical proof of superiority of the prone-pressure arm-lift method over the long-accepted Schafer method was abandoned in order to facilitate action. Sentiment was fairly evenly divided on the issue, much of it reflecting the uncertainty about the physiological identity of electric shock, asphyxiation, and submersion in effect on the lungs.

Meanwhile Pennsylvania Power & Light, according to D. E. Albertson, has already switched to the Nielsen technique and two other utilities were reported about to do so and others likely to take the step before long.

Research Report . . . Eight cases of successful stopping of ventricular fibrillation of dogs' hearts during 1951 were reported by Dr W. B. Kouwenhoven out of the EEI-sponsored research at Johns Hopkins. Application of 1 to 1.5 amp through the heart from either 60 cycle or pulse discharge from a condenser was the stimulus. Some of this success was obtained with large external electrodes on chest to back. Current was 8 to 10 amp with durations of 0.1 or 0.2 seconds. Since no tissue damage was found in the autopsies the success of this revolutionary technique promises feasibility of application in the field to linemen victims of shock. One important medical fact established is that injection of adrenalin definitely impairs the likelihood of reestablishing rhythmic heart pulsation after fibrillation. Kouwenhoven confidently expects to develop a practicable field apparatus.

1951 Safer Than '50 . . . Aggressive attack on the circumstances which give the electric utilities their poor safety performance relative to other industries was promised on behalf of the committee's chairman, W. F. Brown. This program was emphasized in the face of preliminary evidence presented by R. W. White, Pacific Gas & Electric Co, that 1951 will have shown the following improvements over 1950: Frequency 10%, severity 5%, performance index 7½%, and deaths 13% less.

The pattern is the same seven out of ten that has held over a decade for the proportion of shock and burn fatalities, according to D. C. Stewart, Niagara-Mohawk Power Corp. Of the live contact fatalities 25 were at the hands, 14 to arms, 7 to head, and 5 to the body. This was construed as supporting a required use of rubber sleeves in the primary area as well as thorough covering of wires and exposed connections.

•

Class I Utilities Asked to File 3Q CMP Needs

Class I utilities have been asked to file lists of their third quarter controlled material requirements with Defense Electric Power Administration by Feb. 7.

The agency recently sent out DEPA-1 (Revision 3) forms to these utilities on which the requirements are to be listed.

Purpose of the lists is to help determine controlled material requirements for the electric power industry as a whole for the third quarter of 1952. Only class I utilities are asked to participate, but Depa will apply expansion factors to account for the remainder of the industry. The form is not used as a basis for determining allotments to individual utilities.

Extension of time for filing will be granted only under the most urgent circumstances. Questions regarding the forms or extension of time should be addressed to Paul W. Hand, assistant chief of Statistics and Procedures Branch, Defense Electric Power Administration, Interior Department B'dg., Washington 25, D. C. Telephone: Republic 1920, Ex 5165.

I. C. STEELE

99.991% Right

'Cleve' Steele wins 1951 Generation Pool with 'guesstimate' of 370.5 billion kwhr

I. C. Steele is the nation's greatest "master in the art of load forecasting." The retired vice president and chief engineer of Pacific Gas & Electric Co, won his title in the 1951 Kwhr Power Generation Pool. His "guesstimate" of 370,500,000,000 kwhr was within 0.009% of the official total of 370,536,000,000 kwhr listed in this issue of Electrical World.

The pool is conducted annually by Robert M. Hatfield, western manager of Combustion Engineering-Superheater, Inc, who carried it on after leaving the Office of War Utilities, where it was started.

The average this year of the 272 load forecasting experts who entered the pool was within 0.4% of the actual figure. The average of the guesses from Federal Power Commission Region VIII, from which Steele comes, was within 0.2% of the correct figure.

Eight others were given "diplomas" for their estimates. In order they were: E. S. Fields, Cincinnati Gas & Electric Co; O. Titus, Pennsylvania Electric Co; Miss Pat Van Deraa, Department of Interior; Frank Hutton, Babcock & Wilcox Co; C. R. Bailey, Minnesota Power & Light Co; Henry Sargent, Central Arizona Light & Power Co; and C. B. McManus, Southern Co. and W. J. White, Kansas Power & Light Co, who tied for eighth.

Titus, Sargent, and McManus are presidents of operating or holding companies.

YIELDS (%)—Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Jan. 17	2.96	3.01	3.17	4.37	4.38	4.83	5.36	5.91	6.52
Jan. 10	2.99	3.04	3.19	4.29	4.41	4.86	5.38	5.97	6.55
END OF QTR.									
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	3.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13

Data: Reis & Chandler, Inc.

SEC Hearing Delays WWP Sale

Commission opens session today on American P&L's plan to sell utility's stock to 3 PUD's in Washington State

Sell-out of Washington Water Power Co has been stalled—at least temporarily—by Securities and Exchange Commission. A hearing is set for today (Jan. 28) before the SEC on the merits of the sale proposed by WWP's owner, American Power & Light Co (EW, Jan. 7, p 46).

In calling the hearing, SEC made it clear it would try to determine whether the sale is "capable of a reasonably expeditious consummation." American has been under order of the commission to dispose of the WWP stock since 1942. An attempt to sell the stock to the same three Washington State Public Utility Districts now offering to buy it was halted early last year by a state court.

Court Action Likely . . . If SEC does decide the deal proposed by Howard Aller, president of American, cannot be quickly consummated or does not measure up to SEC orders of regulations, it could order Aller to distribute the stock to American stockholders. However, this almost would certainly bring court action from Aller—thus stalling the distribution. Aller has already said he has not yet decided whether to go to court in an effort to block the SEC hearing. Prediction that WWP sale would eventually reach federal courts despite outcome of SEC hearing was made by a PUD spokesman who refused identification.

On the other hand, approval of the sale would be sure to bring several court actions from other interested parties. Threats of such action have been made publicly by the attorney general of Idaho and an attorney for the City of Spokane, Wash. Both bitterly oppose sale of the huge properties of WWP, and argue it would mean breaking the integrated system to bits.

American stockholders, representing nearly a fifth of the outstanding shares, have opposed the sale and favored distribution. Veiled threats of court action to stop any sale have come from that direction.

Thus, either way the SEC decides, it appears likely a federal or state court will be asked to intervene.

Jurisdiction Over Sale . . . Decision to exert jurisdiction over the sale came after SEC had listened to many interested parties, the vast majority of whom asked the commission to take this action (EW, Jan. 21, p 43).

To exert jurisdiction, the commission had to find that the proposed sale was not, in fact, entirely to public bodies. Under the Public Utility Holding Company Act, SEC has no authority to preside over the sale of holding company properties to duly recognized public bodies.

FINANCIAL BRIEFS

New York State Electric & Gas Corp plans to sell $10 million of debentures privately before the end of March . . . **Central Power & Light Co** expects to sell $10 million first mortgage bonds competitively late in March . . . **Frontier Power Co,** Trinidad, Colo., is plan-

Electric Utility Financing

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF JANUARY 17-23			
Bonds			
Indiana & Michigan Electric—1st mtg 1982	$17,000	101.25%	3.185%
Indiana & Michigan Electric—serial notes 1956-1967	6,000	various	2.75-3.20%
Preferred Stock			
Kansas City Power & Light—100,000 sh 4.50% $100 par cum.	$10,000	100%	4.50%
Central Illinois Public Service—50,000 sh 5¼% $100 par	5,000	100%	5.25%
Common Stock			
Pacific Power & Light—552,792 sh (200,000 sh sold by company and balance for selling stockholders)	$8,776	$15.875	6.93%
Kansas City Power & Light—317,792 sh (being offered to holders on 1-for-6 basis, record Jan. 22 to expire Feb. 6)	8,421	$26.50	6.04%
WEEK OF JANUARY 24-30			
Bonds			
Central Illinois Public Service—1st mtg 1982	$5,000	.....	.....
Dayton Power & Light—1st mtg 1982	15,000	.....	.....
Common Stock			
West Penn Electric—440,000 sh (to be offered to common holders on 1-for-8 basis, record Feb. 1 to expire Feb. 18; company will name the price with underwriters bidding for unsubscribed shares)	.....	.....	.....
SCHEDULED FOR JANUARY-FEBRUARY			
Bonds			Bid Date
Pennsylvania Power—1st mtg 1982	$6,000		Feb. 5
Louisville Gas & Electric—1st mtg 1982	12,000		Feb. 5
Nashville, Tenn.—electric power—rev. 1955-1971	2,500		Feb. 5
Tallahassee, Fla.—electric revenues, 1954-1976	1,400		Feb. 6
Preferred Stock			
Pacific Gas & Electric—163,986 sh $25 par 5% 1st Series A (being offered Jan. 15 to employees at 24½ of which 23½ is being paid through payroll deductions, to expire Feb. 8; no underwriting)	$4,099	$24.50	5.10%
Common Stock			
Southwestern Public Service—251,540 sh (to be offered to common holders on 1-for-13 basis, record about Feb. 1 to expire Feb. 14)	.....	.....	.....
Dayton Power & Light—256,007 sh (to be offered to common holders on 1-for-9 basis, record Jan. 28 to expire Feb. 15)	.....	.....	.....
Maine Public Service—35,000 sh (to be offered to common holders on 1-for-5 basis, record about Feb. 4 to expire Feb. 25)	.....	.....	.....

Electric Utility Earnings

Company	Period Months	Ended	Net Income 1951	Net Income 1950	Earnings per Common Share 1951	Earnings per Common Share 1950
Carolina P&L	12	Dec.	$5,687,376	$5,686,847	.....	.....
Central Illinois Light	12	Dec.	2,999,530	2,881,684	$2.78a	$2.98a
Mountain States Power	12	Nov.	1,400,363	1,388,477	1.16	.....
San Diego G&E	12	Nov.	3,504,866	3,548,343	1.09	1.21

a—On shares outstanding at end of each period.

ning to sell $175,000 bonds privately about May 1 and 50,000 shares of common stock . . . **Niagara Mohawk Power Corp** has completed plans with a group of banks to borrow up to $40 million on short-term loans in 1952 of which $10.5 million will be taken down within 30 to 60 days.

REGULATIONS

Indiana Public Service Commission has appointed James R. Stanley, New Castle, Ind., as attorney assistant to Commissioner Crawford F. Parker.

Cuyahoga Falls, Ohio, city officials are considering a plan to bill customers for electric service every two months instead of every month because of the increase in postcard rates to 2¢.

Bangor Hydro-Electric Co has received Maine Public Utilities Commission approval to increase rates by $131,000 annually, which is less than one-fourth the amount the company requested.

Northern States Power Co is asking for rate increase of about $5 million a year or about 7% of 1951 sales, Pres. B. F. Braheney revealed. The net increase after taxes, he said, would be about $2.3 million.

WALL STREET

After advancing to a near record of 16 consecutive sessions without a decline, Dow-Jones averages for utilities closed at 48.74 for the week ended Jan. 19 as compared with the high of 49.23 established on Jan. 14. Following companies recorded new highs during the week: Anaconda Copper Co, Central Illinois Light Co, Central & South West Corp, Cincinnati Gas & Electric Co, Commonwealth Edison Co, Consumers Power Co, Idaho Power Co, Montana Power Co, Niagara Mohawk Power Co, North American Co, Ohio Edison Co, Pacific Gas & Electric Co, Public Service Electric & Gas Co, South Carolina Electric & Gas Co, Southern California Edison Co, Southern Co, Toledo Edison Co, West Penn Electric Co, and Wisconsin Electric Power Co.

•

November Net Income Up 6.8% Over Year Ago

Electric operating revenues of the larger privately owned utilities in the United States in November totaled $452,875,000, an increase of 9.3% above November, 1950, revenues of $414,265,000, according to preliminary figures announced by the Federal Power Commission.

Gross income in November, including other utility operating income, amounted to $95,357,000, an increase of 7.7% for the month. Net income was up 6.8% to $69,672,000 from the $65,238,000 reported for November, 1950.

Revenue deductions (including operating expenses, depreciation, and taxes) were $366,552,000, 10.1% over those of November last year.

CALENDAR

National Association of Purchasing Agents
Public Utility Buyers' Conference, Cleveland Hotel, Cleveland, Ohio, February 4-5.

Instrument Society of America
1952 Regional Power Plant Instrumentation Conference, New York Section, Hotel Statler, New York, February 7-8.

Missouri Valley Electric Association
Industrial-Commercial Sales Conference, Hotel President, Kansas City, Mo., February 7-8; Engineering Conference, Hotel President, Kansas City, Mo., April 2-4.

Pennsylvania Electric Association
Winter Meeting, Transmission-Distribution Committee, Penn Harris Hotel, Harrisburg, Pa., February 7-8; Hydraulic Power Committee, William Penn Hotel, Pittsburgh, Pa., February 7-8; Systems Operation Committee, Benjamin Franklin Hotel, Philadelphia, February 14-15; Winter Meeting, Relay Committee, Fort Stanwix Hotel, Johnstown, Pa., February 20-21; Prime Movers-Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, February 28-29.

★**Power-Communication Contractors Association**
Annual Convention, Roosevelt Hotel, New Orleans, La., February 10-12.

Edison Electric Institute
Electrical Equipment Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, February 11-12; Transmission-Distribution Committee, New Hotel Jefferson, St. Louis, February 14-15; 18th Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 31-April 3; Purchasing Stores Committee, Roosevelt Hotel, New Orleans, La., May 11-14.

Public Information Program
East North Central Region Meeting, Fort Wayne Hotel, Columbus, Ohio, February 21.

American Society for Testing Materials
Spring Meeting-Committee Week, Hotel Statler, Cleveland, Ohio, March 3-7; Annual Meeting, Hotels Statler-New Yorker, New York, June 23-27.

National Electrical Manufacturers Association
Section Meeting, Edgewater Beach Hotel, Chicago, March 10-13; 4th International Lighting Exposition - Conference, Industrial - Commercial Lighting Equipment Section, Cleveland Auditorium, Cleveland, May 6-9.

National Rural Electric Cooperative Association
Annual Meeting, Conrad Hilton Hotel (formerly Stevens Hotel), Chicago, March 10-13.

National Association of Corrosion Engineers
Annual Conference, Buccaneer Hotel, Galveston, Tex., March 10-14.

Southeastern Electric Exchange
Engineering-Operation Section Conference, Jung Hotel, New Orleans, La., March 13-14; Annual Conference, Boca Raton Hotel, Boca Raton, Fla., April 21-23.

Illuminating Engineering Society
South Pacific Coast Regional Conference, Hotel Sir Francis Drake, San Francisco, March 13-14; Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla., April 6-8; Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22; Canadian National Conference, Hotel General Brock, Niagara Falls, Ontario, Can., April 30-May 2; Great Lakes Regional Conference, Hotel Statler, Cleveland, Ohio, May 5-6; East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Pacific Coast Electrical Association
Operating Economics Section Conference, Hotel California, Fresno, Calif., March 20-21; Administrative Services Section Conference, Los Angeles, April 17-18; Business Development Section Conference, Hotel Huntington, Pasadena, Calif., April 24-25.

A&M College of Texas
Annual Conference for Protective Relay Engineers, Department of Electrical Engineering, College Station, Tex., March 24-26.

★**American Society of Mechanical Engineers**
Spring Meeting, University of Washington, Seattle, March 24-26; Semi-annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, June 15-19.

American Power Conference
(Formerly Midwest Power Conference)
Sherman Hotel, Chicago, March 26-28.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28.

★**Tennessee Valley Public Power Association**
Annual Meeting, Peabody Hotel, Memphis, Tenn., March 31-April 1.

Maryland Utilities Association
Lord Baltimore Hotel, Baltimore, April 4.

★**American Institute of Electrical Engineers**
Welding Conference, Rackham Memorial Bldg., Detroit, Mich., April 16-18; arranged jointly by American Welding Society, Detroit Section, and Industrial Electrical Engineers Society, Detroit; Summer General Meeting, Hotel Nicollet, Minneapolis, Minn., June 23-27.

Rocky Mountain Electrical League
Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 20-22.

American Public Power Association
Spring Convention, Hotel Olympic, Seattle, April 29-May 1. Joint Meeting with Northwestern Public Power Association, April 28.

Public Utilities Advertising Association
Annual Convention, Hotel Radisson, Minneapolis, Minn., May 8-9.

International Organization of Standardization
Triennial Meeting, Columbia University, New York, June 9-21.

★ Addition this week.

C. B. McMANUS, SEE president, addressing luncheon meeting of the Industrial Relations Conference, says that the free enterprise system in U. S. is the envy of the rest of world

Employee Training Stressed . . .

. . . at joint meeting in New Orleans. McManus says younger executives must be prepared to take on higher duties

People are the moving force behind any endeavor great or small, important or unimportant, C. B. McManus, president, Southeastern Electric Exchange told the Industrial Relations Conference held at New Orleans, La., Jan. 17-18.

The meeting was sponsored jointly by Edison Electric Institute's Industrial Relations Committee, Southeastern Electric Exchange's Personnel Administration Section, and Southwestern Personnel Group.

McManus, also president of Southern Co, urged adequate training of employees so that they will be able to handle not only their immediate jobs but also be ready to take the "jobs just ahead of them."

"Unless we prepare our younger executives to meet the problems of the future management of our properties, he said, this industry of ours is going to suffer a tremendous blow."

George S. Dinwiddie, president, New Orleans Public Service Inc, opened the conference on the theme, "Good employee relations are essential to good public relations."

More Mixing . . . McManus agreed wholeheartedly with this slogan. He said he does not believe top management mixes sufficiently with employees. Greater association between the two groups, he added, would furnish each: (1) information vital to the proper conduct of business and (2) some orderly routine so that employees are kept currently informed on management policy, attitude, and plans.

Some of the other speakers were: F. L. Larkin, vice president, Wisconsin Electric Power Co; Hugh C. Thuerk, president, New Jersey Power & Light Co; C. B. Boulet, personnel director, Wisconsin Public Service Corp; F. E. Verdin, director of personnel, Cleveland Electric Illuminating Co; H. K. Breckenridge, vice president, West Penn Power Co; J. S. Gracy, vice president, Florida Power Corp; and W. O. Turner, president, Louisiana Power & Light Co.

Winter Strikes . . .

. . . with all its fury: rain, wind, snow disrupt power service in northern California

Flood, lightning, wind, and snow plagued the Pacific Gas & Electric Co distribution system during storms that buffeted northern California for nearly a week in the coastal areas and back into the Sierra mountains.

The company has 2,000 men in the field making repairs. The storm abated Jan. 18 and the men were put to work at full speed before the start of predicted new storms.

Three hydro powerhouses were knocked out of commission and many lines broken by wet, heavy snow.

At the DeSalba powerhouse in Butte County a snowslide broke out a wall. The Deer Creek powerhouse in Nevada County was also inoperative with a forebay full of snow. Operations were limited at El Dorado powerhouse on the American River, which was getting only 4-5 ft sec of water.

Power was cut off at Downieville on the Yuba River for more than a week. The Upper Boardman and Big Tulle canals serving the Alta powerhouse in Placer County were filled with snow and no water could get through.

A 110-kv and a 60-kv line from Shasta County to Eureka, over the rugged Trinity Alps, were broken for three days. Eureka was browned out, supplied only by stand-by steam plants.

Lightning struck a substation at Sausalito in the San Francisco Bay area, fusing three transformers, cutting into the city's power supply for two days.

In southern California, the utilities weathered the storm surprisingly well.

PG&E Sends a Sno-Cat

One of Pacific Gas & Electric Co's seven Sno-Cats, a vehicle with tractor drive in the rear and skis on the front, carried the first man in to the Southern Pacific streamliner, City of San Francisco, which was marooned for four days. The train was snowed in the morning of Jan. 13, and a PG&E lineman reached it late the next day. The Sno-Cat was stationed at Rainbow Tavern, four miles from the train, and served as a shuttle for supplies until the passengers were rescued.

Electrical World

48TH ANNUAL

Report on the Electrical Industry

★

HIGHLIGHTS

BUDGET: $3,792,052,000
Bulk of 1952 budget will go into new generating capacity

GENERATION: 370,536,000,000 kwhr
Up 13% over last year. Pounds of coal per kwhr drops to 1.17

CAPACITY: 75,400,000 kw
For next three years planned new capacity total 28,950,000 kw

ENERGY SALES: 317,300,000,000 kwhr
Rose 13% in 1951. Revenue went up only 10% to $5,640,000,000

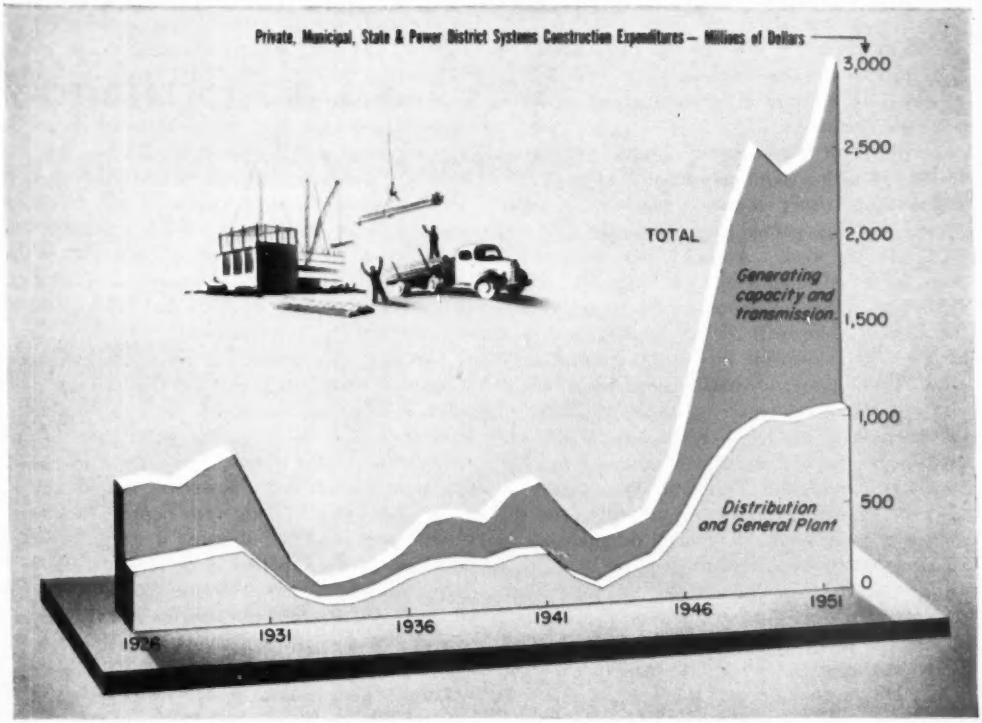
CUSTOMERS: 46,870,000
Increase slightly less than last three years

MANUFACTURING
All product indexes up for 1951 except appliances

The Statistics Summarized

	1944	1945	1946	1947	1948	1949	1950	1951[a]
FINANCIAL[1]								
Fixed Capital ($1,000,000)	13,882	12,667	13,351	14,065	15,720	17,380	19,150	20,950
Securities issued ($1,000,000)	1,018	1,362	1,082	1,577	1,451	1,793	1,708	1,442
New capital	16	40	173	567	1,315	1,445	1,300	1,432
Refunding	1,003	1,322	909	1,010	136	348	408	10
INCOME and OUTGO[1] **($1,000,000)**								
Operating revenue	2,955	3,012	3,127	3,480	3,886	4,113	4,510	4,955
Operating expenses	1,225	1,259	1,385	1,701	2,019	2,030	2,158	2,367
Taxes	677	652	639	664	712	794	948	1,132
Net Income	517	545	651	656	666	765	831	814
Dividends	406	415	466	500	499	655	626	670
Balance to Surplus	111	130	185	156	167	110	205	144
EXPENDITURES ($1,000,000)								
Construction	440	511	823	1,569	2,418	2,954	3,118	3,151
REVENUE ($1,000,000)								
Total from customers	3,277	3,342	3,460	3,853	4,313	4,614	5,087	5,640
Rural[2]	83	90	105	124	141	161	158	176
Residential	1,098	1,167	1,241	1,366	1,533	1,716	1,932	2,175
Small Light and Power	817	850	925	1,031	1,153	1,229	1,334	1,465
Large Light and Power	1,043	1,002	969	1,107	1,251	1,263	1,405	1,550
Other	236	233	220	225	237	245	258	274
ENERGY SALES (1,000,000 kwhr)								
Total to consumers	198,161	193,558	190,794	217,581	240,740	248,542	280,539	317,300
Rural[2]	3,373	3,668	4,431	5,551	6,327	7,384	7,400	8,650
Residential	31,266	34,184	38,571	44,171	50,978	58,139	67,030	77,200
Small Light and Power	29,837	30,438	33,016	38,379	43,193	46,262	50,446	57,450
Large Light and Power	115,187	107,490	98,885	113,523	124,088	120,766	139,065	156,500
Other	18,498	17,778	15,891	15,957	16,154	15,991	16,599	17,400
PRODUCTION (1,000,000 kwhr)								
Generated	228,189	222,486	223,178	255,739	282,698	291,099	329,141	370,536
From fuel	154,244	142,516	144,772	177,314	200,228	201,351	233,203	272,414
From water power	73,945	79,970	78,406	78,425	82,470	89,748	95,938	98,122
CAPACITY (1,000 kw)[3]								
Total generator ratings	49,189	50,111	50,317	52,322	56,560	63,100	68,919	74,678
Fuel	34,603	35,199	35,468	37,351	40,908	46,446	51,244	55,939
Hydro	14,586	14,912	14,849	14,971	15,652	16,654	17,675	18,739
FUEL CONSUMPTION								
Coal (1,000 short tons)	80,080	74,720	72,200	89,530	99,950	83,960	91,870	104,520
Oil (1,000 bbl)	20,862	20,228	36,316	45,308	42,644	66,306	75,420	63,830
Gas (billion cu ft)	359	326	307	373	478	550	628	749
Pounds of coal per kwhr	1.29	1.30	1.29	1.31	1.30	1.24	1.19	1.17
CUSTOMERS (1,000)[2]								
Total number	33,048	34,031	36,140	38,432	40,722	42,851	44,986	46,589
Rural[2]	1,144	1,234	1,381	1,522	1,695	1,804	1,596	1,657
Residential	27,371	28,117	29,769	31,622	33,549	35,375	37,533	38,993
Small Light and Power	4,263	4,398	4,693	4,961	5,132	5,291	5,466	5,529
Large Light and Power	153	162	175	191	204	232	235	248
Other	118	120	122	136	142	148	158	162
People in homes served (1,000)	107,000	110,000	115,000	123,000	130,000	134,000	141,500	147,000
Percent of total civil population	80.0	81	82	86	89	90	94	95
EMPLOYEES[4]	.....	.....	.....	213,000	226,400	233,500	234,000	234,400

[a] Estimated, generally on ten months' operation. [1] Power companies. [2] For 1951 data is that reported on November 1. [3] On specific rural rates only.
[4] Covers employees in the electrical departments of power companies only; new series begun in 1947.



A SHARP INCREASE in the planned expenditures for electric power facilities in 1952 preparatory to addition of 20 million kw of generating capacity in next two years will tax to the limit the supply of material, manpower, and manufactured products

Record Breaking Expansion in 1951

Progress recorded in past year far exceeds that of any previous 12 month period in terms of growth and operating improvements

Private utilities, municipals, and public power districts plan to spend $3 billion in 1952. This represents a gain of 23% over expenditures of $2.44 billion in 1951. Combining this with $650 million for the Corps of Engineers, TVA, and Bonneville and the $138 million to be spent by electric co-ops, we arrive at a total of $3.8 billion.

The largest item in new budgets is for generating equipment which is 46.5% of the total compared with 38.5% in 1951. Although only 7 million kw of generating capacity was added in 1951, utilities plan to add 9.1 million kw in 1952 and 11.7 million kw in 1953. These totals are not adjusted for slippage due to delays in equipment and material deliveries. Total capacity at nameplate rating was 75.4 million kw at the year end.

Almost 2 million customers were added to utility lines in 1951. Sales increased from 280 billion kwhr to 317 billion kwhr, amounting to a 13.2% increase.

Production increased to 370.5 billion kwhr as compared with Electrical World's estimate in May 1951 of 372.0 billion kwhr.

Industrial use increased 12.5%, commercial 13.9%, and residential 15.2%. Residential use per customer made a record increase of 170 kwhr. It went up from 1,830 in 1950 to 2,000. The greatest previous increase was in 1950 totaling 146 kwhr. The rapid increase in use helped to pro-

duce an equal drop in kwhr rates to the customer. The average cost decreased from 2.88¢ to 2.83¢ per kwhr. This 2% drop in cost came while the consumer price index increased 7%. And the decrease came in spite of numerous rate increases for these customers.

Employment in electric utility companies leveled off with a slight gain from 234,000 to 234,400 non-supervisory employees and working supervisors. Earnings gained from an average of $67.81 to $73.18 per week. Average hours worked per week increased from 41.6 to 42.1 in 1951. The industry's ability to operate with approximately the same employment is due to decreased sales activity, more overtime hours, and increased efficiency of manpower utilization particularly in new power stations. Along this same line the industry reached a record low maintenance expense amounting to only 1.9% of electric plant in service in 1950, latest figure available. This compares with 2.05% in 1947. When adjustments are made for the change in price levels, the cost of maintenance as a percentage of electric plant dropped 21% from the 1947 level.

Average coal rates or coal equivalent of gas and oil dropped to 1.17 lb per kwhr from 1.19 in 1950. This was the largest percentage gain in efficiency recorded in recent years. Of course it is due to the record capacity additions of equipment with very low heat rates.

Consumption of oil decreased sharply during 1951, despite a 16.2% increase in generation from fuel. This was due to a change in its relative cost compared with gas and coal. There was a 14% increase in the use of coal and a 19% increase in the use of gas. Consumption of oil is, however, still more than three times as great as it was six years ago.

Stocks of coal on hand at electric utility power plants on Dec. 1, 1951 totaled a record 39,381,543 tons, 22% more than stocks a year ago.

Although the private power companies retained their approximate position representing 80% of the installed capacity in 1951, they only spent 68% of the total for all utilities and added 75% of capacity. In 1952 private companies will spend 70% of the total and add 71.5% of the new capacity. High cost hydro projects of federal power agencies and uneconomical small units of public power groups and electric co-ops account for this difference between expenditures and total capacity.

In 1952 the Corps of Engineers will complete installation of 411,000 kw, TVA 1,238,000 kw, and Bureau of Reclamation 372,000 kw. TVA will add four times as much capacity as it installed in 1951. TVA plans for 1953 and 1954-1,100,000 kw and 620,000 kw respectively.

Although gross revenue of power companies increased 9.9% in 1951 over 1950, this was not sufficient to overcome increased operating expenses. Fuel costs were up 13%, due principally to the lower than average stream flow and the increased dependence upon steam power for load increases. Wages and salaries along with depreciation were in line with expense, showing a 9.6% increase. Other operating expenses were up only 4.5%.

In spite of the repeal of the electrical energy tax in November and the benefits granted on excess profits, the power companies' bill for taxes rose 19.2% in 1951.

Although net income for the year 1951 was 2% below 1950, the bottom had been reached by the middle of the year. Optimism over the future is evident from the increase in common dividends of 7.6% in the face of a declining surplus. Recent trends in security values and lowering of common stock yields show the growing confidence of institutional investors and the general public.

The series of indexes on shipments of electrical products contained in this report are entirely new. They have been completely revised to include more accurate industry data. Shipments of electrical products increased much more rapidly than plant completions. Expenditures for utility equipment increased very little in 1951 whereas shipments of power system equipment were up 30%.

How Electrical Utility Industry Grew

	1941	1950	1951	Percent Change 1950-51	Percent Change 1941-51
Customers	31,607,371	44,986,294	46,870,000	4.33%	48.3 %
Capacity (Kw) Nameplate	42,405,436	68,500,846	75,400,000	10.05%	77.75%
Gross Capacity Additions (Mw)	3,078	6,084	6,985	14.81%	127 %
Generation (Kwhr)	164,787,878,000	328,997,875,000	370,536,000,000	12.62%	124.9 %
Sales (Kwhr)	140,060,159,000	280,538,654,000	317,300,000,000	13.1%	126.6 %
Revenue (Dollars)	$2,665,057,000	$5,086,465,000	$5,640,000,000	10.88%	111.6 %
Construction (Dollars)	$1,100,000,000	$3,118,000,000	$3,151,000,000	1.06%	186.4 %

Construction for 1952 Will Set New Record

Industry-wide survey reveals high level of planning

Construction by the electric utilities totaled $3.2 billion in 1951. Estimates for 1952 indicate a total spending of $3.8 billion.

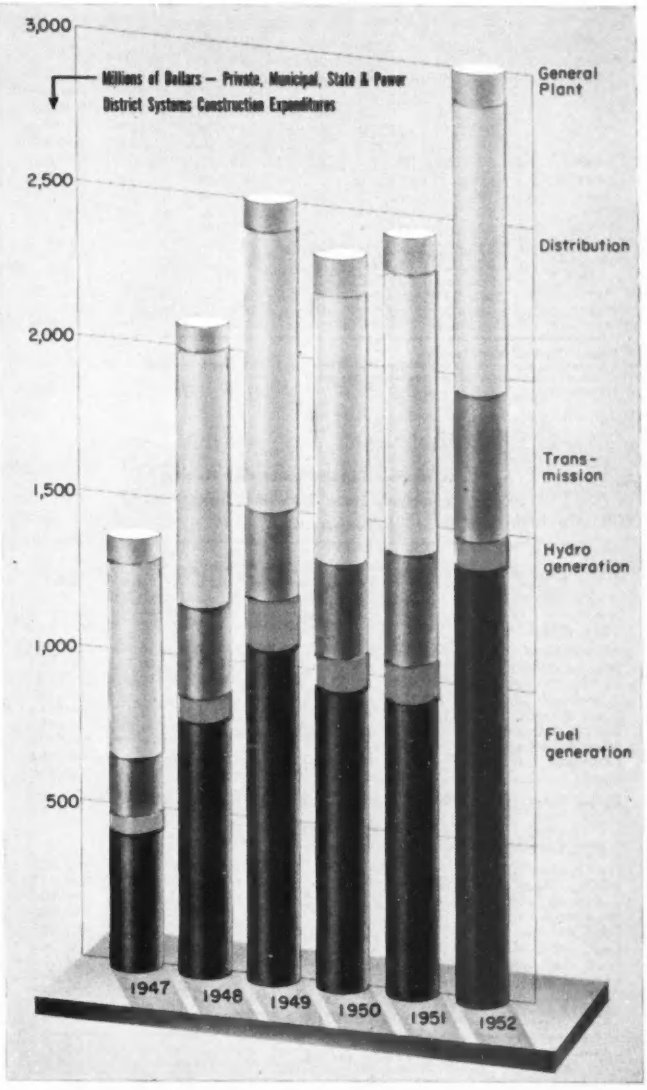
This total of $3.8 billion is the sum of estimates based on data furnished by (1) Private Companies (2) Municipal, State, and Power District Systems (3) Electric Cooperatives (4) three federal agencies, namely, the Bureau of Reclamation, the Corps of Engineers, and the Tennessee Valley Authority.

Private companies own nearly 80% of the nation's total generating capacity. Estimates presented here are solidly founded on reports from utilities owning 94% of this group capacity. Utilities reporting in the survey served 93% of the private companies' customers.

Utilities in the second group own slightly less than 10% of the nation's generating capacity. Estimates presented here are based on reports from 49% of the group's capacity, 41% of the group's customers.

Reports from electric cooperatives provided estimates based on 26.6% of this group's customers, 34.2% of the capacity additions made during 1951 by electric cooperatives.

The federal government owns nearly 10% of the nation's generating capacity. The Bureau of Reclamation, TVA, and Corps



of Engineers control nearly all of this capacity.

Charts and tables for expenditures by type of construction and by region combine data from the first two groups. These estimates are solidly founded on survey returns representing 88% of the combined capacity, 86% of both groups total customers.

Annual Capital Expenditures for New Construction

Private, Municipal, State & Power District Systems

(In Thousands of Dollars)

Year	Fuel	Hydro	Transmission	Distribution	General Plant	Total
1936	36,820	9,030	55,305	184,725	24,000	289,710
1937	113,060	10,540	100,400	223,620	38,600	455,480
1938	133,000	17,600	59,200	238,200	34,000	482,000
1939	101,500	17,900	61,375	226,375	22,850	430,000
1940	200,430	9,270	84,780	266,580	35,520	596,580
1941	219,741	27,186	101,085	272,449	32,687	654,148
1942†	191,671	22,847	85,633	144,180	11,644	455,975
1943	137,059	35,505	42,923	84,683	6,066	306,286
1944	96,126	19,888	61,196	151,969	11,105	340,284
1945	106,166	12,713	68,935	204,492	16,623	408,929
1946	190,955	18,974	106,550	360,980	40,710	718,169
1947	440,547	40,901	195,074	624,038	71,585	1,372,145
1948	813,025	86,188	280,530	822,275	76,070	2,078,088
1949	1,078,081	150,653	288,358	916,475	84,047	2,517,614
1950	960,739	107,730	300,093	879,242	99,367	2,347,171
1951	940,541	125,463	346,059	910,581	120,674	2,443,324
1952‡	1,390,090	102,101	463,561	938,774	107,277	3,001,803

Source: "Electrical World" surveys.
† Expenditure study not made by "Electrical World" in 1942. Figures are those reported by Federal Power Commission for privately owned utilities only.
‡ Prospective.

Construction Expenditures—By Region

Private, Municipal, State & Power District Systems

(Thousands of Dollars)

Region	Fuel	Hydro	Transmission	Distribution	General Plant	Total
1951 (ESTIMATED)						
New England	55,208	6,091	16,804	53,974	6,404	138,481
Middle Atlantic	172,182	9,763	37,452	175,549	16,735	411,681
East North Central	282,436	211	87,137	180,754	42,804	593,342
West North Central	85,109	1,894	40,737	60,459	11,133	199,332
South Atlantic	145,245	7,772	48,659	131,489	12,475	345,640
East South Central	16,229	1,289	15,270	31,880	4,887	69,555
West South Central	66,359	18,283	37,672	91,048	12,577	225,939
Mountain	44,205	19,634	12,056	32,430	4,599	112,924
Pacific	73,574	60,526	50,272	152,998	9,060	346,430
United States	940,547	125,463	346,059	910,581	120,674	2,443,324
1952 (PROSPECTIVE)						
New England	71,624	8,908	18,673	49,586	4,016	152,807
Middle Atlantic	282,980	5,472	63,365	197,416	20,709	569,942
East North Central	363,064	448	128,022	199,371	34,296	725,201
West North Central	106,266	5,129	47,612	66,604	10,414	236,025
South Atlantic	225,114	10,689	66,959	129,271	9,620	441,653
East South Central	28,589	1,482	16,925	28,102	3,547	78,645
West South Central	128,267	0	51,581	95,426	8,736	284,010
Mountain	42,499	8,634	14,676	32,363	5,417	103,589
Pacific	141,687	61,339	55,748	140,635	10,522	409,931
United States	1,390,090	102,101	463,561	938,774	107,277	3,001,803

Source: "Electrical World Survey".

Fuel power station expenditures, 38.5% of the total in 1951, for both groups, will reportedly comprise 46.5% of the total expenditures in 1952. Construction of distribution facilities requiring 37.3% of the total 1951 expenditures of both groups, will take only 31% of the 1952 total. These two accounts take the largest share of construction expenditure, always 75% or more of the total budget.

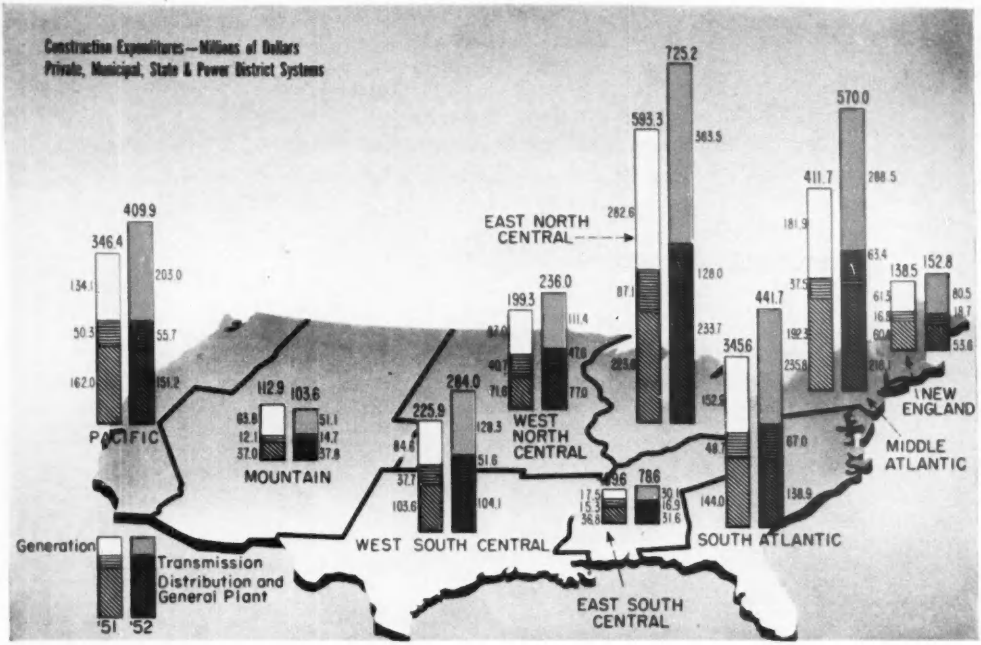
Regional distribution of the 1952 budget shows little change from 1951. The highly industrialized East North Central region again leads with nearly one quarter of the national total for electric plant construction. This region is highest in all kinds of construction except hydro in which it plans to make the lowest expenditure.

Private companies, during 1952, are planning to do 70% of the industry's total construction. Municipal, state, and power district systems are planning 9.3%, cooperatives 3.6%, and the federal agencies 17.2% of the nation's total.

Survey returns indicate that the private companies intend to make fully 72% of the total gross capacity additions.

Expenditure of $2,652 million by the private companies will add to their system 63.3% of the miles of transmission line above 66 kv to be added in 1952, 81.6% of the substation kva, only 20.4% of the nation's total rural line extensions.

Municipal, state, and power district systems will add 9.9% of the total miles of transmission line above 66 kv to be constructed during 1952, 7.7% of the substation kva and 3.8% of the rural lines. To accomplish this they will spend nearly $350 million.



Electric cooperatives will add to their systems 3.3% of the total substation kva, 75.8% of the rural line extensions, 7.7% of the miles of transmission line above 66 kv. Expenditure of nearly $138 million is expected by electric cooperatives during 1952.

During 1952 the Bureau of Reclamation, the TVA, and the Corps of Engineers will add 15.8% of the miles of transmission above 66 kv, 7.3% of the substation kva, spending $653 million.

Canada has for more than 15 years supplied the United States with from one to almost two billion kwhr of electric energy annually. However, the close economic ties between the two countries and the relation of Canadian resources to our own, Electrical World has extended its survey of electric utility construction and expenditures to a number of the large Canadian utilities.

The response, although extremely gratifying, did not provide adequate coverage to give an accurate estimate of the Dominion's utility construction budget. Utilities which were unable to provide data this year did however express a willingness to participate in next year's survey. Chief difficulty in preparing data for use in the survey appears to be differences between Canadian and U. S. statistical and accounting procedures.

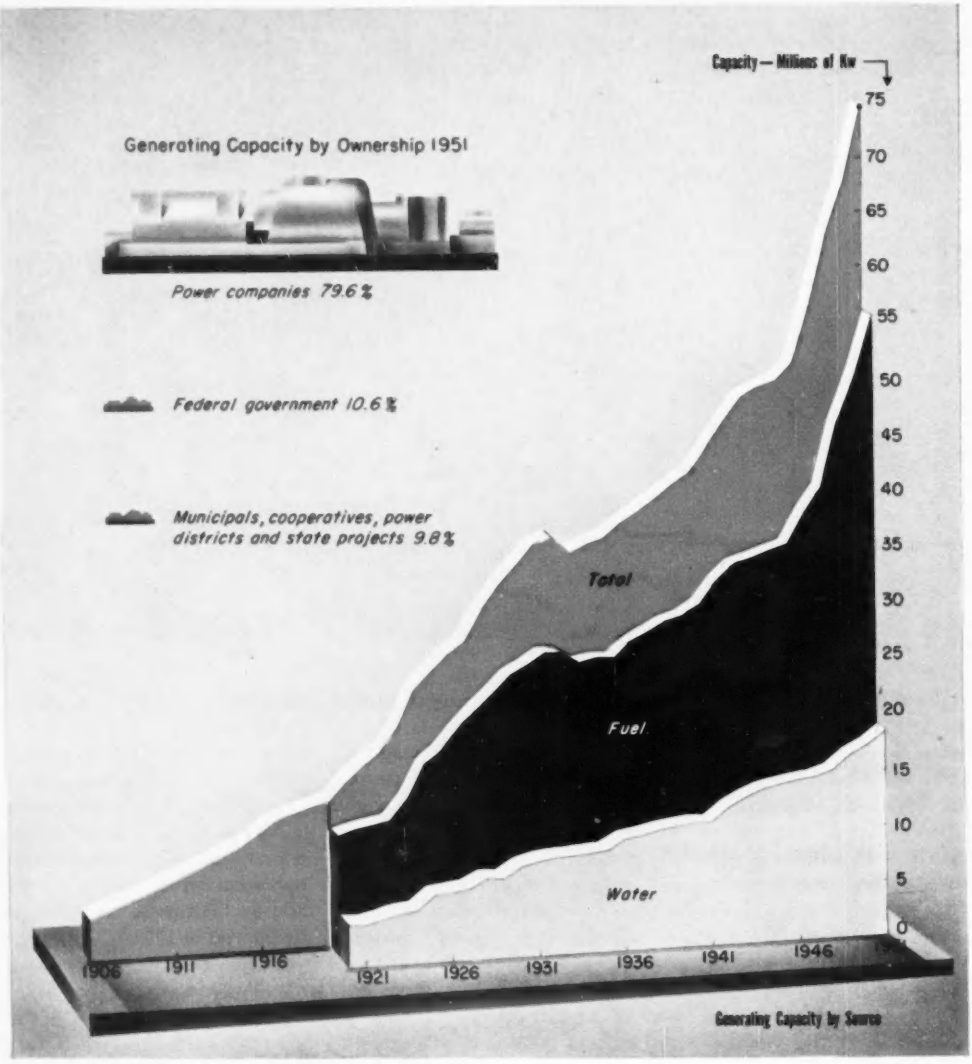
A year-end summary of hydroelectric development indicates an increase of 881,250 hp in 1951. It is estimated that more than 1,700,000 hp of new hydro-electric capacity will be brought into operation before the end of 1953 and an additional 2,000,000 hp by the end of 1955.

During 1951, power consumption continued to expand, the demand for primary energy being more than 13% higher than in 1950.

Construction Expenditures—Dollars

	1951	1952
Private Companies	2,133,926,000	2,651,851,000
Municipal State & Power District Systems	309,398,000	349,952,000
Cooperatives	178,600,000	137,600,000
Federal Agencies*	529,529,000	652,649,000
Total	**3,151,453,000**	**3,792,052,000**

Source: "Electrical World" Survey.
* Bureau of Reclamation, TVA, Corps of Engineers.



Increase in Capacity

Nation's total rises to 75,400 Mw as 7,000 Mw are added in 1951. Thermal stations account for most of increase. Private companies own 79.6%

Increase in net generating capacity during the 12 month period ended November 1, 1951 stands at 7,169 Mw. A probable increase of 7,000 Mw during 1951 will bring the total capacity to nearly 75,400 Mw at the end of 1951.

Generating Capacity by Regions
(In Thousands of Kw)

Region	1948			1949			1950			1951*		
	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel
New England	3,566	922	2,644	3,890	932	2,958	4,051	971	3,080	4,242	972	3,270
Mid. Atlantic	11,742	1,590	10,152	12,624	1,611	11,013	13,225	1,602	11,623	13,946	1,601	12,345
E. No. Central	12,864	742	12,122	14,588	763	13,825	16,083	828	15,255	17,036	850	16,186
W. No. Central	3,978	564	3,414	4,556	575	3,981	5,024	577	4,447	5,403	577	4,826
So. Atlantic	7,288	2,221	5,067	7,988	2,218	5,770	8,857	2,297	6,560	9,739	2,297	7,442
E. So. Central	3,741	2,335	1,406	4,171	2,562	1,609	4,464	2,721	1,743	5,134	2,946	2,188
W. So. Central	3,358	385	2,973	4,005	420	3,585	4,717	463	4,254	5,429	545	4,884
Mountain	2,852	2,051	801	3,150	2,197	953	3,445	2,282	1,163	3,900	2,587	1,313
Pacific	7,171	4,842	2,329	8,130	5,376	2,754	9,054	5,933	3,121	9,849	6,364	3,485
United States	56,560	15,652	40,908	63,100	16,654	46,446	68,919	17,675	51,244	74,678	18,739	55,939

Source: Federal Power Commission. * Data to November 1.

Generating Capacity by Ownership
(In Thousands of Kw)

Year	Power Companies	Local†	Federal	Total Local and Federal
1936	31,787	2,491	804	3,295
1937	31,958	2,829	833	3,662
1938	33,246	3,090	1,156	4,246
1939	33,908	3,304	1,650	4,955
1940	34,399	3,584‡	1,944	5,528
1941	36,041	3,933	2,371	6,364
1942	37,442	4,395	3,216	7,611
1943	39,128	4,501	4,322	8,823
1944	39,733	4,570	4,886	9,456
1945	40,307	4,723	5,081	9,804
1946	40,335	5,063	4,920	9,983
1947	41,986	5,308	5,027	10,335
1948	45,381	5,654	5,525	11,179
1949	50,484	6,406	6,210	12,616
1950	55,176	6,822	6,921	13,743
1951*	59,435	7,348	7,895	15,243

Source: Federal Power Commission. * Data to November 1. † Includes municipals, cooperatives, power districts and state projects. ‡ 1940 and following figures revised to exclude publicly owned transit capacity.

Installed Capacity
(In Thousands of Kw)

Year	Type of Prime Mover		
	Fuel	Water	Total
1937	25,444	10,176	35,620
1938	26,835	10,657	37,492
1939	27,859	11,004	38,863
1940	28,703	11,224	39,927
1941	30,588	11,817	42,405
1942	32,211	12,842	45,053
1943	34,067	13,884	47,951
1944	34,603	14,586	49,189
1945	35,199	14,912	50,111
1946	35,468	14,849	50,317
1947	37,351	14,971	52,322
1948	40,908	15,652	56,560
1949	46,446	16,654	63,100
1950	51,244	17,675	68,919
1951*	55,939	18,739	74,678

Source: Federal Power Commission. * Data to November 1. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad classifications.

Continues at High Rate

Largest increase during the 12 months ended November 1, 1951, 1,422 Mw, was made in the region with the largest capacity—East North Central—where industrial demands are high.

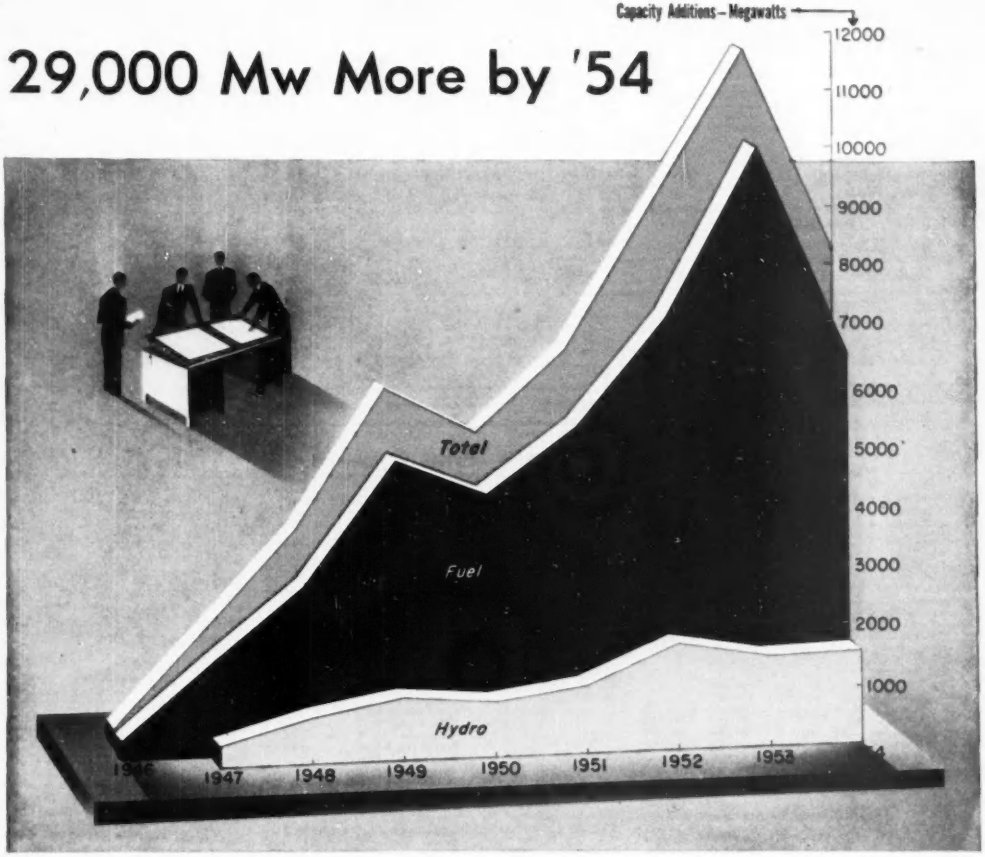
Percentagewise the largest increase during this period, 19.4% was made in the West South Central region, a region which has done nearly one quarter of the total U. S. industrial building since Korea, one eighth before World War II. Many of these industries are big users of power.

Number and Installed Capacity of Electric Utility Generating Plants
By States and Type of Prime Mover
On November 1, 1951

Division and State	Number[a] of Utilities	Number[b] of Plants	Total Capacity Kilowatts	Generator Capacity in Kilowatts of Plants Operated by[b]					
				Water Power		Steam Power		Internal Combustion Engines	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	**1,562**	**3,861**	**74,677,711**	**1,453**	**18,738,991**	**1,059**	**53,970,178**	**1,349**	**1,968,542**
New England	**100**	**318**	**4,242,197**	**214**	**972,865**	**68**	**3,302,545**	**36**	**67,387**
Maine	17	85	411,349	61	270,462	8	117,500	16	23,387
New Hampshire	12	48	398,274	41	261,984	5	133,250	2	3,040
Vermont	20	77	211,664	60	179,977	8	19,750	9	11,937
Massachusetts	35	71	1,773,329	33	167,372	31	1,582,255	7	23,702
Rhode Island	6	10	359,271	4	3,250	5	355,800	1	221
Connecticut	10	27	1,088,310	15	89,220	11	993,990	1	5,100
Middle Atlantic	**104**	**340**	**13,945,575**	**176**	**1,600,653**	**134**	**12,290,872**	**30**	**54,050**
New York	53	210	6,612,117	147	1,153,327	45	5,420,695	18	38,095
New Jersey	11	20	2,177,556	3	6,350	14	2,168,024	3	3,182
Pennsylvania	40	110	5,155,902	26	440,976	75	4,702,153	9	12,773
East North Central	**291**	**687**	**17,035,993**	**298**	**850,078**	**335**	**15,893,105**	**154**	**292,810**
Ohio	57	95	4,647,411	6	11,525	69	4,605,943	20	29,943
Indiana	45	81	2,363,234	22	36,944	43	2,289,660	16	36,630
Illinois	59	102	4,660,879	12	48,629	60	4,555,627	30	56,623
Michigan	63	210	3,461,921	130	385,090	33	2,962,725	47	114,106
Wisconsin	67	199	1,902,548	128	367,890	30	1,479,150	41	55,508
West North Central	**474**	**902**	**5,402,997**	**121**	**577,255**	**216**	**4,014,463**	**565**	**811,279**
Minnesota	81	177	1,236,513	40	136,622	51	952,827	86	147,064
Iowa	97	204	1,232,557	30	138,151	48	872,491	126	221,915
Missouri	75	115	1,121,980	7	150,523	31	860,165	77	111,242
North Dakota	14	46	198,004	.....	.....	17	162,040	29	35,964
South Dakota	40	73	169,910	5	3,421	10	99,600	58	66,889
Nebraska	80	151	616,838	34	142,303	25	386,790	92	87,745
Kansas	87	136	827,195	5	6,185	34	680,550	97	140,460
South Atlantic	**140**	**397**	**9,738,719**	**160**	**2,296,801**	**129**	**7,288,043**	**108**	**153,868**
Delaware	5	7	148,208	.....	.....	5	143,150	2	5,058
Maryland	13	29	1,204,895	3	271,325	13	916,600	13	16,970
District of Columbia	2	3	508,000	1	3,000	2	505,000	.....	.....
Virginia	23	74	1,276,751	38	182,578	18	1,070,004	18	24,169
West Virginia	12	34	1,455,454	10	100,880	16	1,349,760	8	4,814
North Carolina	30	84	1,832,788	50	661,860	20	1,143,271	14	27,657
South Carolina	12	42	1,027,372	27	652,595	9	369,180	6	5,597
Georgia	12	44	1,160,772	27	411,902	14	745,950	3	2,920
Florida	31	80	1,124,472	4	12,661	32	1,045,128	44	66,683
East South Central	**56**	**129**	**5,134,475**	**40**	**2,945,898**	**56**	**2,163,827**	**33**	**24,750**
Kentucky	14	31	1,015,569	5	360,860	22	648,301	4	6,408
Tennessee	13	38	1,917,238	23	1,373,075	11	540,950	4	3,213
Alabama	4	25	1,829,763	12	1,211,963	9	615,340	4	2,460
Mississippi	25	35	371,905	.....	.....	14	359,236	21	12,669
West South Central	**167**	**384**	**5,428,740**	**33**	**545,174**	**104**	**4,562,165**	**247**	**321,401**
Arkansas	19	39	588,293	6	153,340	13	411,645	20	23,308
Louisiana	30	60	969,889	.....	.....	14	905,700	46	64,189
Oklahoma	47	94	801,115	4	73,624	23	657,820	67	69,671
Texas	71	191	3,069,443	23	318,210	54	2,587,000	114	164,233
Mountain	**172**	**413**	**3,900,208**	**198**	**2,586,680**	**68**	**1,127,503**	**147**	**186,025**
Montana	13	31	441,982	19	425,938	4	11,968	8	4,076
Idaho	14	51	458,599	42	453,615	1	400	8	4,584
Wyoming	25	49	152,498	17	91,997	11	50,820	21	9,681
Colorado	45	91	572,665	31	143,860	24	398,973	36	29,832
New Mexico	21	40	309,889	4	24,910	13	250,592	23	34,387
Arizona	19	53	1,067,375	15	765,540	10	228,500	28	73,335
Utah	27	81	301,528	60	94,545	5	186,250	16	20,733
Nevada	8	17	595,672	10	586,275	.....	.....	7	9,397
Pacific	**58**	**291**	**9,848,814**	**213**	**6,364,187**	**49**	**3,427,655**	**29**	**56,972**
Washington	20	54	3,092,112	38	2,890,536	9	197,820	7	3,756
Oregon	18	72	992,379	51	785,494	12	198,810	9	8,075
California	20	165	5,764,323	124	2,688,157	28	3,031,025	13	45,141

Notes: [a] Total includes 81 duplications because of utilities having generating plants in more than one state.
[b] For the approximately 169 combination plants each type of prime mover is counted as a separate plant.

29,000 Mw More by '54



In the next three years, generation will be expanded by about forty percent, or 29,000 megawatts, to keep in step with the expected demand and to assure a more adequate margin of reserve. The 1953 and 1954 figures bear this out, as these are the years when defense production is scheduled to be in full swing.

Electrical Worlds' recently completed survey of new generating capacity additions reveals that 28.95 million kilowatts will be added in the next three years. Of this, 31.4 percent is scheduled for 1952, 40.5 percent for 1953 and the remaining 28.1 percent for the year 1954.

Interestingly enough, this years utility estimates for generating capacity additions for 1952 and 1953 are about 35 percent higher than reported in last years Electrical World survey. In addition, the actual generating capacity added during 1952 was slightly less than estimated in 1950, likely due to delays in delivery of materials.

Of the 9,069 megawatts scheduled for 1952, 71.5 percent is planned by power companies and 28.5 percent by local and federal agencies.

Gross Capacity Additions

Year	Megawatts		
	Fuel	Hydro	Total
1939	915	370	1,285
1940	1,310	480	1,790
1941	2,292	786	3,078
1942	1,764	955	2,719
1943	1,936	1,048	2,984
1944	721	739	1,460
1945	759	409	1,168
1946	404	20	424
1947	2,065	138	2,203
1948	3,697	726	4,423
1949	5,825	1,101	6,926
1950	5,032	1,052	6,084
1951	5,735	1,250	6,985
1952*	7,215	1,854	9,069
1953*	10,148	1,564	11,712
1954*	6,419	1,750	8,169
After 1954	2,451	14,069	16,520

Source: "Electrical World" Surveys, Federal Power Commission.
* Prospective for 1952 and after.

Summary of Capacity Additions Reported to Electrical World—Kw

	1951	1952	1953	1954	After 1954
STEAM					
Power Companies	5,069,723	5,830,050	8,529,000	5,296,250	2,219,000
Local* and Federal	605,250	1,310,800	1,574,000	1,087,500	192,000
Totals, Steam	5,674,973	7,140,850	10,103,000	6,383,750	2,411,000
HYDRO					
Power Companies	140,000	624,816	176,400	203,200	538,500
Local and Federal	1,110,200	1,229,600	1,387,167	1,546,734	13,530,700
Totals, Hydro	1,250,200	1,854,416	1,563,567	1,749,934	14,069,200
INTERNAL COMBUSTION **					
Power Companies	22,851	44,000	23,000	20,950	8,000
Local and Federal	37,094	29,628	22,805	14,313	31,436
Totals, Internal Combustion	59,945	73,628	45,805	35,263	39,436
TOTALS ALL POWER					
Power Companies	5,232,574	6,498,866	8,728,400	5,520,400	2,765,500
Local and Federal	1,752,544	2,570,028	2,983,972	2,648,547	13,754,136
Grand Totals	**6,985,118**	**9,068,894**	**11,712,372**	**8,168,947**	**16,519,636**

* Includes municipals, rural cooperatives, power districts and state projects. ** Includes gas turbine capacity additions.

Steam Additions—Power Companies

Reporting Systems	Added in 1951	1952	1953	1954	After 1954
Power Companies					
Alabama Power Co	140,000	100,000	125,000	125,000	.....
Alpena Power Co	.....	.....	3,000	.....	.....
Appalachian Electric Pr	125,000	.....	251,300	.....	.....
Arkansas Missouri Pr Co	.....	.....	11,250	.....	.....
Arkansas Pr & Lt Co	132,000	99,000	250,000	.....	.....
Atlantic City Elec Co	.....	14,000	.....	60,000	.....
Black Hills Pr & Ltg Co	11,500	.....	.....	.....	.....
Boston Edison Co	.....	81,250	.....	81,250	.....
California Elec Pr Co	.....	60,000	40,000	.....	.....
Cambridge Elec Lt Co	20,000	.....	.....	.....	.....
Carolina Pr & Lt Co	60,000	120,000	.....	70,000	.....
Central Arizona Lt & Pr	.....	.....	.....	120,000	.....
Central Hudson G & E	.....	60,000	.....	60,000	.....
Central Illinois E & G	.....	30,000	.....	30,000	.....
Central Illinois Light Co	.....	60,000	.....	.....	.....
Central Illinois P S Co	.....	60,000	60,000	.....	.....
Central Louisiana Elec	.....	20,000	20,000	.....	.....
Central Maine Pr Co	.....	30,000	30,000	.....	.....
Central Power & Lt Co	30,000	30,000	.....	60,000	60,000
Cincinnati Gas & Elec	.....	100,000	100,000	125,000	.....
Cleveland Electric Illum	120,000	.....	300,000	.....	.....
Cliffs Power & Lt Co	.....	.....	.....	.....	7,500
Columbus & S. Ohio	.....	60,000	60,000	.....	.....
Comm. Edison & Subs	150,000	110,000	360,000	300,000	.....
Connecticut Lt & Pr Co	66,300	.....	.....	75,000	.....
Cons. Edison Co. N. Y.	310,000	180,000	320,000	.....	.....
Cons. Gas Elec Lt & Pr	75,000	100,000	75,000	.....	125,000
Consumers Power Co	.....	170,000	106,000	135,000	.....
Dallas Pr & Lt Co	60,000	.....	60,000	.....	80,000
Dayton Pr & Lt Co	130,000	60,000	60,000	.....	.....
Delaware Pr & Lt Co	120,000	.....	.....	75,000	.....
Derby Gas & Elec Co	.....	23,000	.....	.....	.....
Detroit Edison Co	200,000	.....	375,000	150,000	.....
Duke Power Co	180,000	200,000	250,000	250,000	.....
Duquesne Lt Co	.....	160,000	.....	100,000	.....
Eastern Shore P S Co.	30,000	.....	.....	.....	.....
Electric Energy Inc	.....	250,000	250,000	.....	.....
El Paso Elec Co	30,000	.....	.....	40,000	.....
Empire District Elec Co	.....	.....	40,000	.....	.....
Fitchburg Gas & Elec Lt	7,125	.....	.....	.....	.....
Florida Power Corp	40,000	70,000	80,000	30,000	60,000
Florida Power & Lt Co	28,250	60,000	66,000	66,000	.....
Gaylord Electric Service	.....	.....	15,000	.....	.....
Georgia Pr Co	.....	140,000	200,000	60,000	.....
Gulf Pr Co	.....	70,000	40,000	.....	.....
Gulf States Utilities	75,000	60,000	60,000	140,000	.....
Hartford Elec Lt Co	.....	.....	66,000	.....	.....
Houston Ltg & Pr Co	75,000	100,000	200,000	100,000	.....
Illinois Pr Co	.....	.....	175,000	.....	.....
Indiana & Mich Elec	125,000	125,000	.....	.....	.....
Indianapolis Pr & Lt Co	40,000	60,000	60,000	.....	.....
Interstate Pr Co	.....	25,000	.....	20,000	.....
Iowa Elec Lt & Pr Co	.....	15,000	.....	30,000	.....
Iowa-Illinois Gas & Elec	.....	.....	2,000	.....	60,000
Iowa Pr & Lt Co	.....	.....	110,000	.....	66,000
Iowa P S Co	27,500	5,000	16,500	.....	40,000
Iowa Southern Utilities	.....	.....	40,000	.....	.....
Jersey Central Pr, Lt Co	.....	62,500	.....	.....	125,000
Kansas City Pr & Lt Co	132,000	.....	99,000	.....	.....
Kansas Gas & Elec Co	.....	40,000	60,000	40,000	.....
Kansas Pr & Lt Co	30,000	30,000	50,000	.....	.....
Kentucky Utilities Co	30,000	60,000	60,000	.....	100,000
Lake Superior District Pr	.....	20,000	.....	.....	.....
Long Island Ltg Co	.....	99,000	99,000	99,000	99,000
Louisiana Pr & Lt Co	70,000	105,000	.....	.....	.....
Louisville Gas & Elec	.....	65,000	.....	100,000	.....
Luzerne County G & E	.....	.....	.....	.....	20,000
Madison Gas & Elec Co	.....	.....	30,000	.....	.....
Metropolitan Edison Co	150,000	.....	75,000	.....	.....
Minnesota Pr & Lt Co	33,000	.....	88,000	44,000	.....
Mississippi Pr Co	40,000	.....	40,000	.....	.....
Mississippi Pr & Lt Co	132,000	.....	198,000	.....	.....
Mississippi Valley P. S.	12,500	.....	.....	.....	.....
Monongahela Pr Co	74,750	66,000	.....	100,000	.....
Montana Pr Co	66,000	.....	.....	.....	.....
Montaup Electric Co	60,000	.....	.....	.....	60,000
Nappinee Utilities Co	1,800	.....	.....	.....	.....
New England Elec System	75,000	75,000	50,000	.....	.....
New Orleans P. S. Co	.....	28,000	.....	82,000	.....
New York State E & G	75,000	50,000	100,000	.....	100,000
Niagara Mohawk Pr	80,000	160,000	240,000	80,000	.....
Northern Indiana P. S.	70,015	.....	.....	.....	100,000
Northern States Pr Co	32,500	66,000	.....	40,000	130,000
Ohio Edison Co	.....	.....	212,000	135,000	.....
Ohio Power Co	.....	125,000	251,500	.....	.....
Oklahoma Gas & Elec	50,000	66,000	.....	66,000	.....
Pacific Gas & Elec Co	453,333	235,000	535,000	300,000	.....
Pennsylvania Elec Co	.....	68,700	125,000	125,000	.....
Pennsylvania Pr Co	.....	85,000	.....	.....	.....
Pennsylvania Pr & Lt Co	100,000	.....	125,000	125,000	.....
Pennsylvania Water & Pr	.....	.....	.....	66,000	.....
Philadelphia Elec Co	.....	125,000	275,000	.....	200,000
Potomac Edison System	.....	66,000	.....	.....	.....
Potomac Electric Pr Co	.....	25,000	.....	90,000	90,000
Public Service Co of Colorado	97,650	.....	76,000	66,000	.....
Public Service Co of Indiana	60,000	90,000	90,000	180,000	.....
Public Service Co of New Hamp	.....	40,000	.....	.....	50,000
Public Service Co of New Mex	6,000	20,000	.....	.....	.....
Public Service Co of Okla	.....	75,000	.....	75,000	75,000
Public Service E & G	125,000	145,000	145,000	185,000	.....
Rochester Gas & Elec	50,000	.....	50,000	.....	50,000
Rockland Lt & Pr Co	22,000	.....	.....	.....	.....
San Diego Gas & Elec	.....	50,000	.....	80,000	.....
Savannah Elec & Pr Co	.....	.....	.....	20,000	.....
Scranton Electric Co	.....	.....	44,000	.....	.....
South Carolina E & G	40,000	3,200	150,000	.....	.....
Southern California Ed	.....	100,000	100,000	250,000	.....
Southern Colorado Pr Co	7,500	.....	11,500	.....	11,500
Southern Indiana G & E	20,000	.....	.....	40,000	.....
Southwestern Gas & E	30,000	30,000	40,000	60,000	.....
Southwestern P. S. Co	37,500	68,750	100,000	.....	.....
St Joseph Lete Pr Co	20,000	.....	.....	20,000	.....
Superior W Lt & Pr	.....	12,650	.....	.....	.....
Tampa Electric	.....	.....	40,000	.....	.....
Texas Electric Service	.....	119,000	.....	166,000	.....
Texas Pr & Lt Co	.....	.....	80,000	200,000	.....
Toledo Edison Co	60,000	.....	.....	.....	100,000
Tucson Gas Elec Lt & Pr	.....	.....	20,000	40,000	.....
Union Elec Co of Mo	.....	110,000	110,000	.....	350,000
United Illuminating Co	.....	.....	30,000	.....	.....
Utah Pr & Lt Co	66,000	75,000	.....	.....	.....
Virginia Elec & Pr Co	100,000	90,000	90,000	.....	.....
Western Colorado Pr Co	5,000	.....	5,000	.....	.....
Western Lt & Telephone	.....	.....	15,000	.....	.....
Western Mass. Elec Co	.....	46,000	.....	.....	.....
West Penn Pr Co	.....	.....	135,000	.....	.....
West Texas Utilities Co	25,000	.....	66,000	120,000	.....
Wisconsin Elec Pr Co	.....	120,000	.....	120,000	.....
Wisconsin Pr & Lt Co	60,000	.....	60,000	.....	60,000
Wisconsin P. S. & Subs	62,500	.....	80,000	.....	.....
Totals	5,069,723	5,830,050	8,529,000	5,296,250	2,219,000

Steam Additions—Co-ops Municipals, Public Utility Districts, State & Federal Projects

Reporting Systems	Added in 1951	1952	1953	1954	After 1954
Co-ops, Municipals, Public Utility Districts, State and Federal Projects					
Alliance, Neb.	.....	.....	.....	.....	5,000
Ames, Iowa	7,500	.....	.....	7,500	.....
Atlantic, Iowa	.....	.....	.....	.....	5,000
Austin, Minn.	.....	.....	.....	10,000	.....
Austin, Texas	40,000	.....	.....	.....	.....
Braintree, Mass.	.....	7,500	.....	.....	.....
Burbank, Cal.	.....	.....	30,000	.....	.....
Cleveland, Ohio	.....	50,000	.....	.....	.....
Coffeyville, Kans.	.....	.....	.....	15,000	.....
Colorado Springs, Col.	.....	15,000	15,000	.....	.....
Columbus, Ohio	.....	.....	.....	12,500	.....
Consumers Public Pr District	.....	7,500	.....	7,500	.....
Crawfordsville, Indiana	.....	.....	.....	15,000	.....
Danville, Va.	.....	23,000	.....	.....	.....
Dairyland Power Coop.	17,250	.....	30,000	.....	30,000
Detroit, Mich.	.....	.....	.....	.....	40,000
Dover, Ohio	.....	10,000	.....	.....	.....
Fairbury, Neb.	.....	.....	.....	.....	5,000
Fremont, Neb.	.....	.....	.....	10,000	.....
Ft Collins, Col.	4,000	.....	.....	.....	10,000
Ft Pierce, Fla.	.....	.....	7,500	.....	.....
Ft Wayne, Ind.	.....	.....	.....	.....	20,000
Glendale, Cal.	.....	.....	20,000	.....	.....
Greenwood, Miss.	.....	5,000	.....	.....	.....
Hamilton, Ohio	23,500	10,000	.....	.....	.....
Hastings, Neb.	6,000	.....	.....	.....	.....
Henderson, Ky.	10,000	.....	.....	.....	.....
Holyoke, Mass.	10,000	.....	.....	.....	.....
Imperial Irrigation Dist.	.....	30,000	.....	.....	.....
Iola, Kans.	.....	.....	.....	.....	3,000
Jacksonville, Fla.	60,000	.....	.....	.....	.....
Jamestown, N. Y.	20,000	.....	.....	.....	.....
Jonesboro, Ark.	.....	.....	7,500	.....	.....
Key West, Fla.	.....	10,000	.....	.....	.....
Lafayette, La.	8,000	.....	.....	7,500	.....
Lakeland, Fla.	.....	.....	.....	20,000	.....
Lamar, Col.	.....	.....	5,000	.....	.....
Lansing, Mich.	25,000	.....	.....	40,000	.....
Los Angeles, Cal.	.....	.....	.....	200,000	156,000
Martins Ferry, Ohio	.....	.....	.....	5,000	.....
McPherson, Kans.	.....	.....	.....	.....	15,000
Menasha, Wisc.	.....	.....	7,500	.....	.....
Moorhead, Minn.	.....	.....	6,000	.....	.....
Nebraska Pub Pr System	30,000	.....	.....	.....	40,000
New Ulm, Minn.	.....	.....	.....	.....	.....
Northeast Mo. El. Pr. Coop.	15,000	.....	.....	.....	.....
Omaha Public Pr Dist.	40,000	.....	.....	60,000	.....
Orrville, Ohio	.....	.....	.....	.....	10,000
Ottawa, Kans.	.....	.....	.....	.....	4,000
Pasadena, Cal.	.....	.....	.....	40,000	.....
Piqua, Ohio	12,500	.....	.....	.....	.....
Poplar Bluff, Mo.	.....	.....	1,800	.....	.....
Provo, Utah	.....	.....	.....	.....	.....
Reading, Ohio	.....	.....	.....	.....	5,000
Salt River Improvement Dist.	.....	.....	30,000	.....	.....
San Antonio, Texas	30,000	.....	.....	60,000	60,000
South Carolina, P. S. Auth.	.....	.....	.....	96,000	.....
South Haven, Mich.	.....	.....	.....	7,500	.....
Springfield, Ill.	.....	.....	20,000	.....	.....
Tacoma, Wash.	.....	.....	.....	18,000	.....
Taunton, Mass.	.....	.....	7,500	.....	.....
Tennessee Valley Auth	225,000	1,035,000	945,000	585,000	.....
Traverse City, Mich.	5,000	.....	7,500	.....	7,500
Troy, Indiana	5,000	.....	.....	.....	.....
Vineland, N. J.	.....	.....	7,500	.....	.....
Wallingford, Conn.	.....	.....	22,500	.....	.....
Watertown, S. D.	.....	.....	.....	7,500	.....
Winnetka, Ill.	.....	.....	.....	7,500	.....
Wyandotte, Mich.	11,500	.....	.....	.....	7,500
Yazoo City, Miss.	.....	.....	.....	10,000	.....
Totals	**605,250**	**1,310,800**	**1,574,000**	**1,087,500**	**192,000**

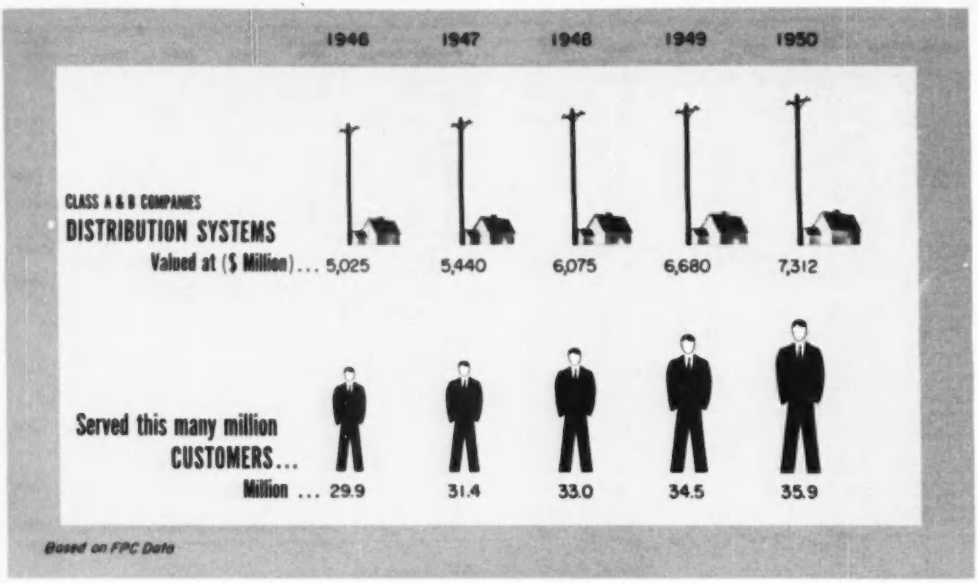
Hydro Additions—All Agencies

Power Companies					
Alabama Pr Co.	.....	55,000	.....	5,000	.....
Bangor Hydro-Elec Co	.....	.....	.....	.....	.....
California Oregon Pr Co	18,000	38,000	25,000	60,000	50,000
Central Hudson G & E Corp.	.....	25,000	.....	.....	.....
Central Maine Pr Co.	.....	.....	.....	45,000	.....
Central Vermont P S Co & Subs.	3,000	.....	.....	.....	.....
Dahlberg Lt & Pr Co.	.....	450	.....	.....	.....
Georgia Pr Co.	20,000	.....	45,000	.....	.....
Green Mountain Pr Co	.....	5,500	.....	.....	.....
Holyoke Water Pr Co.	15,000	.....	.....	.....	.....
Idaho Pr Co.	.....	82,500	.....	.....	.....
Maine P S Co	.....	.....	.....	9,000	16,500
Montana Pr Co.	.....	.....	56,000	.....	.....
Nantahala Pr & Lt Co.	.....	6,366	9,000	.....	.....
New England Elec System	.....	.....	.....	.....	150,000
Niagara Mohawk Pr Corp.	.....	30,000	.....	19,200	.....
Northern States Pr Co.	.....	8,000	.....	.....	.....
Pacific Gas & Elec Co.	.....	.....	99,000	.....	.....
Pacific Power & Lt Co.	.....	108,000	.....	.....	.....
Portland General Elec.	.....	19,400	.....	.....	.....
Rochester Gas & Elec Corp.	.....	3,600	.....	.....	.....
Rockland Lt & Pr Co.	.....	.....	.....	.....	18,000
South Carolina Elec Gas Co.	.....	.....	.....	65,000	.....
Southern California Edison Co.	84,000	.....	.....	.....	126,000
Union Elec Co of Mo & Subs.	.....	.....	43,000	.....	.....
Virginia Elec & Pr Co.	.....	.....	.....	.....	178,000
Washington Water Pr Co	.....	.....	200,000	.....	.....
Wisconsin Michigan Pr Co.	.....	.....	.....	12,400	.....
Totals	**140,000**	**684,816**	**176,400**	**203,200**	**538,500**
Co-ops, Municipals, Public Utility Districts, State and Federal Projects					
Dairyland Power Coop	18,750	.....	.....	.....	.....
Imperial Irrigation District	.....	.....	10,000	.....	.....
Los Angeles, Cal.	.....	.....	112,500	.....	.....
Lower Colorado River Auth.	80,000	.....	.....	.....	.....
Pontotoc El Pwr Assoc	7,000	.....	.....	.....	.....
Provo, Utah	.....	.....	.....	.....	1,000
Seattle, Wash.	60,000	90,000	180,000	.....	90,000
Sulphur Springs Valley El Coop.	1,500	4,000	5,500	.....	.....
Tacoma, Wash.	5,000	27,000	80,000	180,000	.....
Tennessee Valley Auth	69,800	202,600	165,500	44,000	.....
U S Bureau of Reclamation	593,800	379,500	259,167	309,334	980,700
U S Corps of Engineers	274,400	411,000	697,000	813,400	12,519,000
Totals	**1,110,200**	**1,229,600**	**1,387,167**	**1,546,734**	**13,530,700**

Internal Combustion Additions—All Agencies

Power Companies					
Bangor Hydro-Elec Co	.....	5,000G.T.	.....	.....	.....
Central Vermont P S Co	.....	.....	.....	.....	.....
F L P & Subs.	6,000G.T.	12,000G.T.	.....	.....	6,000G.T
Connecticut Lt & Pr Co	.....	10,000G.T.	10,000G.T.	.....	.....
Consumers Pr Co.	576	.....	.....	.....	.....
Iowa Elec Lt & Pr Co.	2,300	.....	.....	.....	.....
Mountain States Pr Co	800	.....	.....	.....	.....
New England Elec System	5,000	.....	5,000G.T.	.....	.....
New York State Elec & Gas Corp.	.....	.....	.....	200	.....
Northern States Pr Co.	1,175	.....	.....	.....	.....
Northwestern P S Co.	.....	2,500	.....	3,750G.T.	.....
Oklahoma Gas & Elec Co.	.....	3,500G.T.	.....	.....	.....
Public Electric Lt Co.	.....	.....	2,000	2,000	2,000
Public Service Co of Okla.	6,000G.T.	.....	.....	15,000G.T.	.....
Texas Pr & Lt Co.	1,000	5,000G.T.	.....	.....	.....
Utah Pr & Lt Co.	.....	1,000	.....	.....	.....
Western P S Co.	.....	.....	6,000G.T.	.....	.....
West Texas Utilities Co	.....	5,000G.T.	.....	.....	.....
Totals	**22,851**	**44,000**	**23,000**	**20,950**	**8,000**
Co-ops, Municipals, Public Utility Districts, State and Federal Projects					
Bluffton, Ohio	.....	.....	5,000	.....	.....
Bryan, Ohio	.....	.....	.....	3,000	.....
Decatur, Ind.	.....	.....	3,810	.....	3,810
Denton, Tex.	.....	2,410	3,000	.....	.....
Federated R. E. A.	.....	.....	1,230	.....	2,500
Ft Wayne, Ind.	.....	.....	.....	10,000G.T.	.....
Grand Haven, Mich.	.....	2,000	5,500	3,000	.....
Houma, La.	.....	.....	1,500G.T.	.....	1,500G.T.
Hudson, Mass.	.....	3,000	.....	.....	3,000
Indian Elec Coop, Inc.	.....	1,000	.....	.....	.....
Key West, Fla.	.....	1,100	1,100	.....	.....
Lake Worth, Fla.	.....	5,000	.....	.....	.....
M & A Elec Pwr Coop	.....	9,404	.....	.....	.....
Nebraska City, Neb.	.....	.....	.....	.....	1,500
Norwich, Conn.	.....	.....	.....	.....	7,500G.T.
Richmond, Va.	.....	.....	.....	.....	.....
Rockville Centre, N. Y.	.....	1,870	4,300	.....	.....
Sulphur Springs Valley El Coop.	.....	5,500	.....	5,500	.....
Thumb Elec Coop.	.....	.....	1,313	.....	1,313
Vero Beach, Fla.	.....	3,200	2,875	.....	.....
Western Minn. Pwr Corp	.....	2,610	.....	1,305	.....
Totals	**37,094**	**39,628**	**22,805**	**14,313**	**31,436**

G.T. Gas Turbine. Installations.



Transmission Holds Record Pace

Industry to equal its 1951 record of 30,000 high line miles and will install 35% more substation capacity than last year

In 1952 an aggregate of 30,438 miles of transmission line, of all voltages, will be built by the various components of the power industry in this country. Despite curtailments, this proposed construction is within 300 miles of the 30,775 miles built in 1951. However, the division among voltage classes is different. This year the mileage is about equally divided above and below 66 kv. Last year 60% was in lines below 66 kv.

Of the 30,438 miles planned for this year, private companies, municipal and state utilities will build 23,723 miles, compared with 19,830 miles in 1951. Co-ops and Federal agencies plan to build 7,715 miles in 1952; built 10,945 last year.

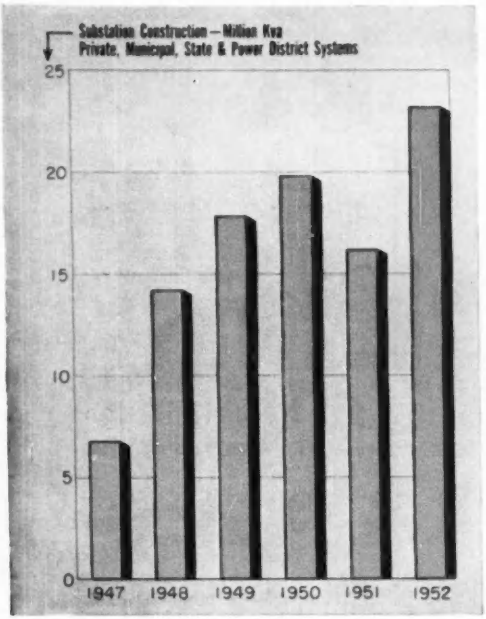
Capacity of substations projected for this year by all industry groups totals 25,968,000 kva according to Electrical World's survey. This represents an estimated investment of $402 million. The increase in capacity is 35% and in investment 25%, compared with 1951.

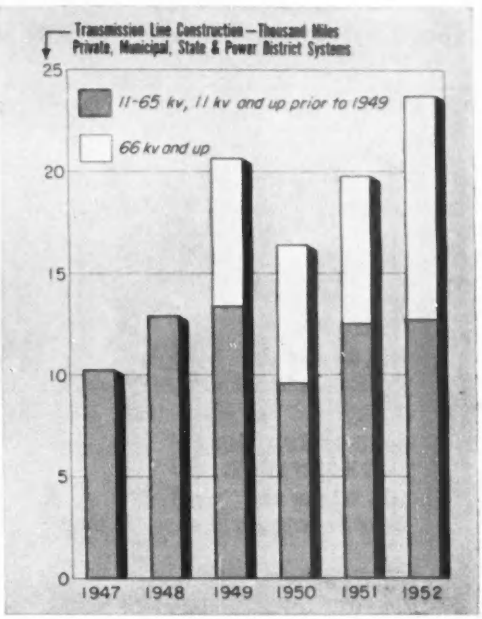
Latest available data on electric distribution investment is confined to Class A and B utilities. These figures show an increase in investment during 1950 of $632 million bringing total invested to $7.3 billion to supply 35.9 million customers or $203.67 per customer vs. $167.92 in 1946.

Miles of Transmission Line Construction
Private, Municipal, State & Power District Systems

Region	1950*		1951		1952	
	(11-65 kv)	(66 kv and up)	(11-65 kv)	(66 kv and up)	(11-65 k	(66 kv and up
New England	227	113	191	161	300	195
Mid. Atlantic	823	480	1,104	357	1,279	500
E. N. Central	1,025	1,195	1,346	1,240	1,570	2,464
W. N. Central	1,274	472	558	993	792	1,733
So. Atlantic	3,019	1,167	2,241	1,377	2,203	2,258
E. S. Central	573	514	726	508	570	378
W. S. Central	1,378	1,172	2,184	1,564	2,225	1,679
Mountain	539	812	1,532	409	1,170	489
Pacific	757	881	2,590	749	2,600	1,318
United States	9,615	6,806	12,472	7,358	12,709	11,014

Source: "Electrical World" Surveys.
*TVA included in 1950.





Miles of Transmission Line Construction

	1951		1952	
	(11–65 kv)	(66 kv & up)	(11–65 kv)	(66 kv & up)
Private Companies	10,892	6,332	11,047	9,588
Municipal, State & Power District Systems	1,580	1,026	1,662	1,426
Cooperatives	5,491	4,967	1,603	1,160
Federal Agencies*	275	212	1,662	2,290
Total	**18,238**	**12,537**	**15,974**	**14,464**

Source: "Electrical World" Survey.
* Bureau of Reclamation TVA.

Substation Construction

	1951		1952	
	Thousands of Kva	Thousands of Dollars	Thousands of Kva	Thousands of Dollars
Private Companies	14,657	231,489	21,237	303,745
Municipal, State & Power District Systems	1,589	42,721	1,994	43,983
Cooperatives	970	14,600	855	15,500
Federal Agencies*	2,094	31,918	1,882	39,183
Total	**19,310**	**320,728**	**25,968**	**402,411**

Source: "Electrical World" Survey.
* Bureau of Reclamation, TVA, Corps of Engineers.

Substation Construction—Thousands of Kva
Private, Municipal, State & Power District Systems

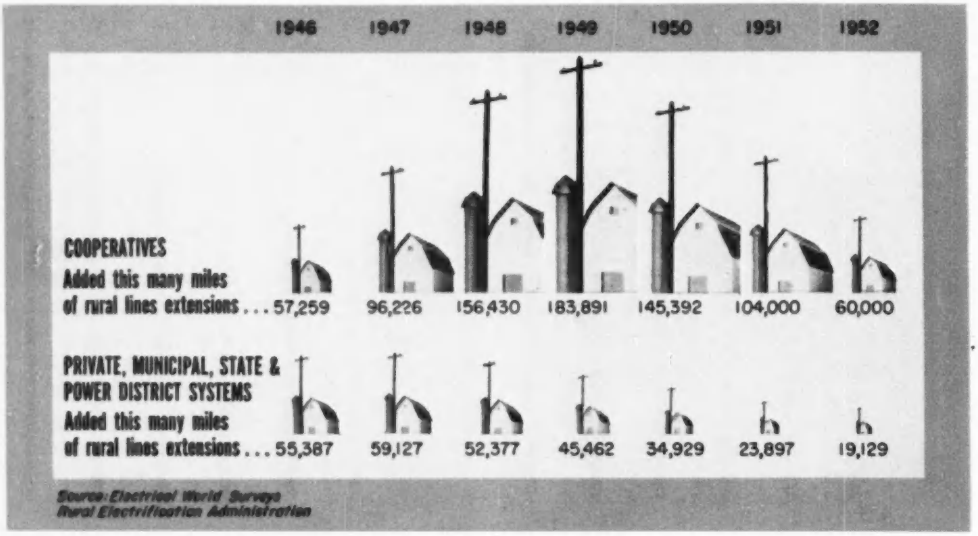
Region	1948*	1949*	1950*	1951	1952
New England	497	546	717	784	958
Middle Atlantic	2,193	1,950	2,658	2,065	3,222
E. N. Central	3,399	3,887	3,972	4,331	6,347
W. N. Central	1,414	1,936	2,229	1,258	2,059
South Atlantic	1,935	2,545	2,848	2,309	3,259
E. S. Central	683	943	1,871	796	1,369
W. S. Central	996	2,284	2,609	1,950	2,399
Mountain	601	912	817	667	574
Pacific	2,441	2,775	2,094	2,086	3,044
United States	14,158	17,779	19,815	16,246	23,231

Source: "Electrical World" Surveys.
* Include TVA.

Substation Construction—Thousands of Dollars
Private, Municipal, State Power District Systems

Region	1948	1949	1950	1951	1952
New England	12,170	14,337	14,631	10,463	12,610
Mid. Atlantic	31,160	37,793	42,495	46,861	70,013
E. N. Central	49,095	54,015	59,847	56,940	83,173
W. N. Central	15,755	47,766	27,784	16,744	22,668
So. Atlantic	31,170	43,608	34,426	38,358	43,585
E. S. Central	11,050	14,859	7,337	11,938	12,527
W. S. Central	17,275	32,446	29,165	29,546	36,473
Mountain	11,245	15,048	10,432	9,440	11,285
Pacific	52,690	57,667	42,697	53,920	55,394
United States	231,610	317,541	268,814	274,210	347,728

Source: "Electrical World" Surveys.



Will Build 79,000 Rural Line Miles

Rural line construction continues as industry moves in to connect the remaining farms and reinforce lines for growing loads. Rate of rural line building has dropped sharply since 1949 peak

Four significant facts stand out among the statistics of rural electrification, based on Electrical World's annual budget survey. They are these:

1. During 1952, all groups of the industry will spend $138 million to build 79,000 miles of new farm lines and extension.

2. This is a 19% drop in capital expenditure and a 38% reduction in miles of line compared with 1951, when the industry spent $171 million to build 128,000 miles.

3. Less money will be spent and fewer lines built in 1952 than in any year since the end of the war, as the job nears completion.

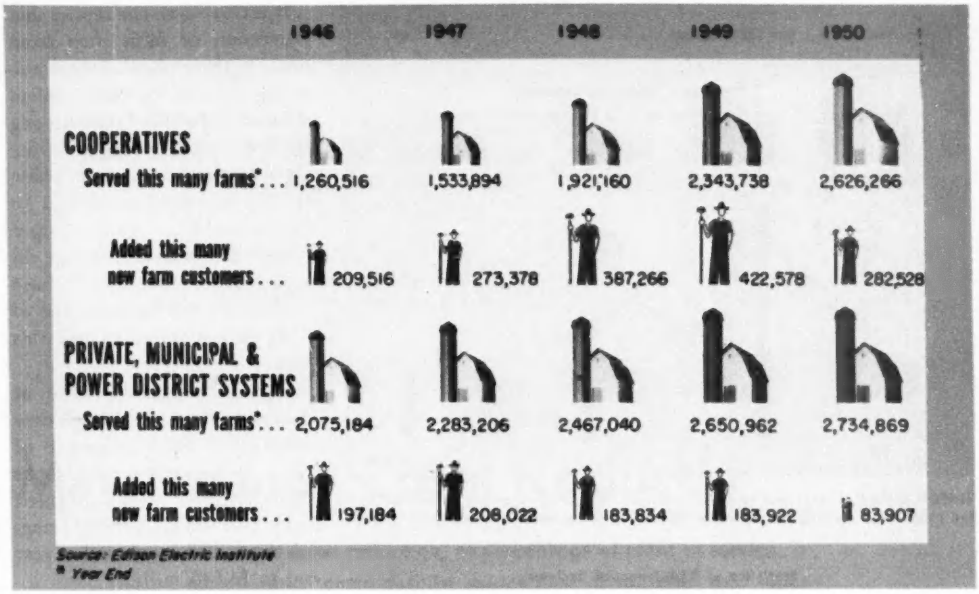
4. Biggest share of the curtailment in line building will be by cooperatives. Electrical World Survey returns indicate they built 104,000 miles in 1951, will build 60,000 miles this year.

The accompanying chart shows the trend of farm electrification from 1946-1950. It is based on the Census Bureau definition of a "farm" that prevailed before 1950. No data is available, for the new definition, that shows this trend. However, a spot estimate, as of April 1, 1950, under this new definition indicates that the total number of "farms" is

Rural Line Construction

	1951		1952	
	Miles	Thousands of Dollars	Miles	Thousands of Dollars
Private Companies	19,861	50,261	16,134	41,982
Municipal, State & Power District Systems	4,036	10,636	2,995	9,129
Cooperatives	104,000	110,500	60,000	86,500
Total	**127,897**	**171,397**	**79,129**	**137,611**

Source. "Electrical World" Survey.


1946
1947
1948
1949
1950
COOPERATIVES
Served this many farms*... 1,260,516 1,533,894 1,921,160 2,343,738 2,626,266
Added this many new farm customers... 209,516 273,378 387,266 422,578 282,528
PRIVATE, MUNICIPAL & POWER DISTRICT SYSTEMS
Served this many farms*... 2,075,184 2,283,206 2,467,040 2,650,962 2,734,869
Added this many new farm customers... 197,184 208,022 183,834 183,922 83,907
Source: Edison Electric Institute
* Year End

5,382,000, of which 5,129,000 were then occupied. Of these 4,156,000 had been electrified by that date. Up to August 1951 some 350,000 more had been electrified, bringing the total electrified by then to 4,500,000.

It is clear from these data that the job of building lines to the nation's occupied farms is almost finished. This is reflected in the rapid drop in line building since 1949 when the industry built a total 229,353 miles of rural line.

For the first time this year Electrical World's annual budget survey sought to evaluate the extent to which farm lines are being strengthened to meet demands imposed by the rapid growth of farmstead loads.

Replies from 240 rural electric cooperatives show that during the past year 13,332 miles of line were improved through either conversion to three phase, the installation of a larger conductor or resort to a higher voltage. Material restrictions explain the drop to 11,681 miles of line improvement presently scheduled for 1952.

Miles of Rural Distribution Line Extensions Private, Municipal, State & Power District Systems

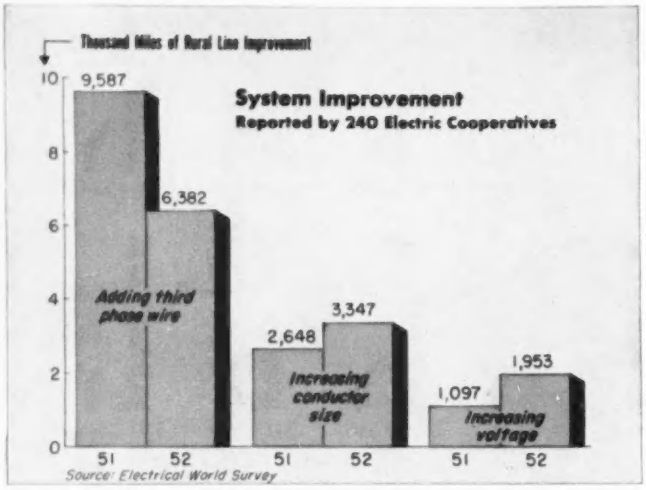
Region	1948	1949	1950*	1951	1952
New England	2,138	808	1,052	445	448
Middle Atlantic	3,515	2,995	1,878	1,221	986
E. N. Central	7,362	4,103	2,806	2,025	1,570
W. N. Central	6,576	4,776	2,768	1,398	1,065
South Atlantic	12,810	12,538	11,036	6,085	4,303
E. S. Central	4,506	4,947	4,397	3,469	2,242
W. S. Central	7,815	7,030	5,465	4,342	4,172
Mountain	3,357	3,012	2,499	1,664	1,145
Pacific	4,298	5,253	3,028	3,248	3,198
United States	52,377	45,462	34,929	23,897	19,129

Source: "Electrical World" Surveys.
* TVA included in 1950.

Rural Line Construction—Thousands of Dollars Private, Municipal, State & Power District Systems

Region	1950	1951	1952
New England	2,446	1,384	1,363
Middle Atlantic	6,021	5,957	4,356
East North Central	7,231	7,893	7,354
West North Central	5,116	3,887	3,489
South Atlantic	23,680	12,217	9,213
East South Central	8,805	4,902	3,521
West South Central	11,953	9,042	8,236
Mountain	5,105	4,211	2,775
Pacific	11,871	11,404	10,804
United States	82,228	60,897	51,111

Source: "Electrical World" Surveys.



REINFORCEMENT of rural lines to handle mounting loads, focused mainly on addition of a third phase wire. Material restrictions, in 1952, will even the balance among three methods.

Statistics of REA-Financed Systems

ITEM	Calendar Year 1949	Calendar Year 1950	Calendar Year 1951[1]
CUMULATIVE YEAR-END DATA			
Total Loans Approved	$1,999,279,707	$2,311,636,614	$2,484,000,000
Distribution Lines	$1,657,444,285	$1,879,150,367	$2,015,300,000
Generation and Transmission	$327,420,834	$413,230,101	$447,600,000
Consumer Facilities	$14,414,588	$19,256,146	$21,500,000
Funds Advanced	$1,433,000,126	$1,706,207,276	$1,944,900,000
Systems in Operation	995	1,007	1,012
Miles of Line in Operation	943,385	1,088,777	1,177,000
Consumers Connected	3,040,425	3,413,407	3,656,000
Systems Generating Power During Year	95	100	90
Generating Plants—Kw Capacity	310,579	413,162	598,000
ANNUAL DATA			
Energy Generated—Kwhr	903,411,574	1,076,945,615	1,368,000,000
Energy Purchased—Kwhr	6,541,739,108	8,164,801,159	10,040,000,000
Total System Input—Kwhr	7,445,150,682	9,241,746,774	11,408,000,000
Energy Sold—Kwhr	6,227,471,179	7,778,734,502	9,717,000,000
Operating Revenues	$196,717,304[3]	$241,342,540[3]	$285,800,000
Cost of Power[2]	$66,756,385	$79,402,275	$94,400,000
Distribution Expenses—Operations	$14,426,638	$18,235,988	$21,900,000
Distribution Expenses—Maintenance	$8,813,891	$10,515,766	$12,900,000
Consumers Accounting & Collecting	$7,433,996	$9,112,801	10,600,000
All Other Operating Expenses	$25,872,562	$32,049,916	$37,400,000
Total Operating Expenses	$123,303,472	$149,316,746	$177,200,000
Net Non-Operating Margin	$633,346	$834,803	$900,000
Interest Expenses	$20,132,708	$26,110,181	$30,600,000
Net Revenue Before Depreciation	$53,805,906[4]	$66,576,952[4]	$78,900,000
Depreciation	$35,907,025	$47,675,975	$56,800,000
Net Margin After Depreciation	$17,898,881	$18,900,977	$22,100,000

Source of Data: Monthly Operating Reports of REA borrowers and records of the REA.
[1] Based on nine (9) months actual data and one (1) to three (3) months estimated.
[2] Cost of Power includes cost of purchased power and prime costs involved in the production and transmission of generated energy.
[3] Does not include revenues reported by REA borrowers from whom figures for other items were not available: $311,289 for 9 borrowers for 1949 and $30,687 for 3 borrowers for 1950.
[4] After deducting miscellaneous revenue deductions not shown separately: $108,564 for 1949 and $173,464 for 1950.

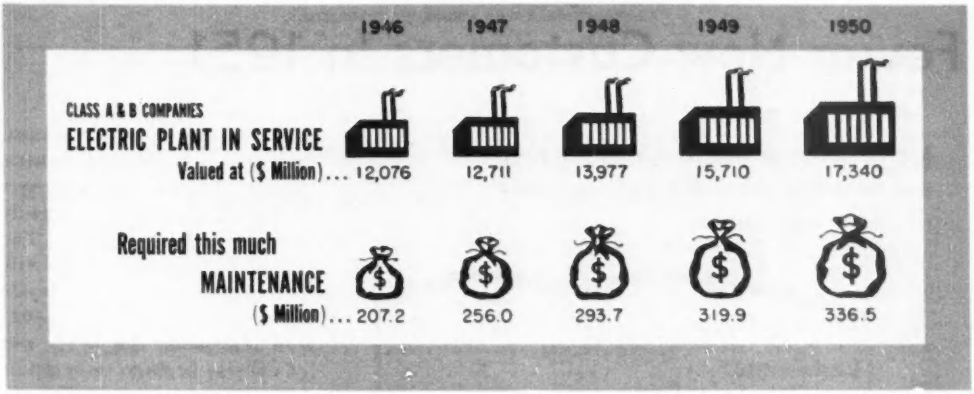
It is clear from the replies that conversion of farm lines from single to three phase is the dominating solution to the problem of handling heavier loads. Among the 240 co-ops 9,587 miles of line were converted to three phase in 1951 and 6,382 miles will be so converted in 1952. Larger conductor will be installed on 3,346 miles of line in 1952 and 1,953 miles will be converted to a higher operating voltage this year.

The accompanying table of Operating Data for Cooperatives shows that REA approval of loans to borrowers now totals $2,484 million. Funds advanced in 1951 were $238,693,000 bringing the accumulated total at year end to $1,945 million.

Although the number of cooperatives generating power dropped from 100 in 1950 to 90 in 1951, the capacity of generating plants increased 185,000 kw to a total of 598,000 kw, at year-end.

Average annual energy usage per co-op customer appears to be going up at an accelerated rate, having risen from 2,241 kwhr in 1949 to 2,411 in 1950 to 2,747 in 1951. The corresponding bill grew from $70.78 to $74.79 to $80.79 and per kwhr revenue dropped correspondingly from 3.16¢ to 3.10¢ to 2.94¢ for the same three years.

Cost of energy per customer rose from $24.02 in 1949 to $24.61 in 1950 to $26.68 in 1951. It is to be observed that the unit cost of input energy declined steadily from 8.97 mills in 1949 to 8.59 in 1950 and 8.27 in 1951. This decrease further reflects the rapid rise in usage per farm customer which has already been noted.



Maintenance Costs Reduced

FPC data shows reduction, as percentage of plant in service, in maintenance costs despite risings cost of material and labor

Outstanding has been the electric utility industry's ability to reduce maintenance costs despite continued increases in the cost of materials and labor.

True, maintenance rose sharply after 1946. But this was due to the long standing deferment of maintenance during World War II.

In 1948 the cost of maintenance for privately owned Class A & B utilities had risen to 2.1% of electric plant in service. In 1949 this figure fell to 2.0% and in 1950 to 1.9%.

Adjustment for increases in material and labor costs indicates that Class A and B electric companies have managed to effect a 20.8% reduction in the cost of maintenance since 1947.

The FPC data shown here is for class A and class B privately owned electric utilities. Figures for 1951 and 1952 are based on Electrical World's survey, cover a greater number of utilities.

Maintenance Expenditures
(Thousands of Dollars)

Region	1951	1952
New England	29,779	30,794
Middle Atlantic	99,643	107,139
East North Central	83,958	88,202
West North Central	28,591	29,598
South Atlantic	42,610	41,694
East South Central	9,753	10,804
West South Central	27,087	28,845
Mountain	11,233	12,055
Pacific	39,489	43,489
United States	372,143	392,620

Source: "Electrical World" Survey. Includes Private, Municipal, State & Power District Systems.

Maintenance Expenditures Privately Owned Class A and B Electric Utilities
(Thousands of Dollars)

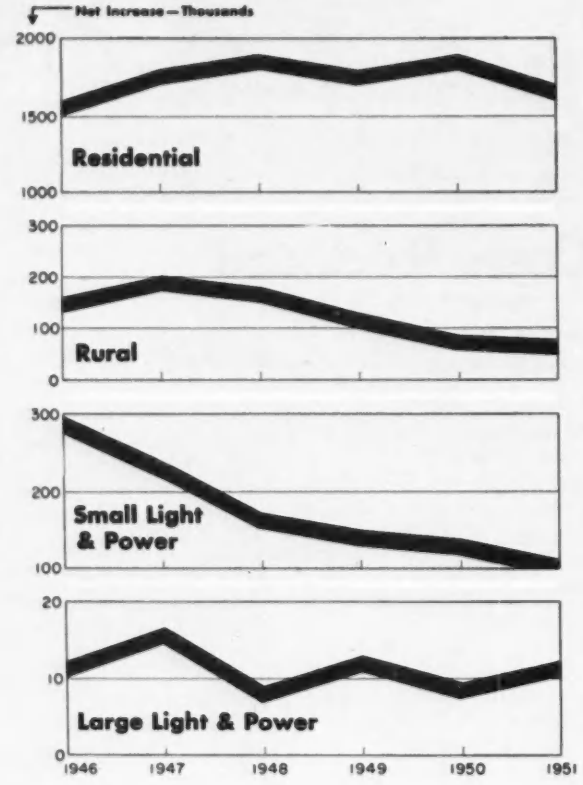
	1946	1947	1948	1949	1950
Steam	77,327—37.3%	96,683—37.8%	109,489—37.4%	117,864—36.8%	120,340—35.7%
Hydro	11,287— 5.4	12,056— 4.7	12,798— 4.3	15,584— 4.9	14,361— 4.3
Int. Comb	1,365— 0.7	1,784— 0.7	2,322— 0.8	2,054— 0.6	1,565— .5
Transmission	18,846— 9.2	22,414— 8.8	24,335— 8.3	28,069— 8.8	27,953— 8.4
Distribution	91,484—44.1	114,160—44.5	134,939—45.9	145,639—45.5	160,649—47.7
General	6,926— 3.3	8,892— 3.5	9,771— 3.3	10,723— 3.4	11,591— 3.4
Totals	207,235—100	255,989—100	293,654—100	319,933—100	336,459—100

Source- Federal Power Commission.

Fewer New Customers In 1951

How Many New Customers

does the electric utility industry add each year?



Net Increase of Customers by Class of Service

	1946	1947	1948	1949	1950	1951*
Residential	1,635,409	1,819,352	1,922,037	1,828,070	1,890,183	1,430,038
Rural	161,050	202,345	179,843	130,736	86,731	64,803
Small Light & Power	297,166	240,045	172,535	150,738	140,413	93,320
Large Light & Power	12,324	16,701	9,167	13,195	9,603	10,190
Street Lighting	839	2,530	1,368	1,255	2,080	859
Other Public Authorities	2,499	11,022	5,114	4,751	6,442	3,398
Street Railways	—17	—25	—16	—5	1	—2
Electrified Steam Railroads	0	0	—1	0	—3	—2
Interdepartmental	—52	—311	—9	53	63	13
Total	2,109,218	2,291,659	2,290,038	2,128,793	2,135,513	1,602,616

Source: Edison Electric Institute
* Data to November 1, 1951

For 5 years, 1946-1950, annual increase in number of electric utility customers was well over 2 million. That level apparently was not reached in 1951. The 1951 total given here, 46,588,910, covers only 10 months. The increase in that period was 1,602,616. Extending this to the end of the year in direct ratio results in an increase to about 1.9 million in 1951.

Estimated population, end of 1951, is 155.5 million and estimated number of dwelling units is 44.5 million. These figures indicate an average family of 3.5 people. Dividing population by 40,954,000, the estimated number of residential and rural customers at end of 1951, gives 3.8, which is quite close to the average family size. With population increasing at the rate of about 2 million per year, the indicated increase in number of residential and rural customers for the next few years is considerably under 2 million. These figures make it appear that growths of population and of number of electric utility customers are approaching parallelism. However, the level of home building assure an increase of customers of more than a million per year on the average.

Of nine census regions in the country, largest 1951 customer growth, both in number (289,000) and percentage (5.25), occurred in the South Atlantic states. In number, next largest increases were in the East North Central and Middle Atlantic regions. But each of these regions has about twice as many customers as any of the others

Customers by States and Classifications*

	Total		Residential and Rural		Small Light and Power		Large Light and Power		Other†	
	1950	1951	1950	1951	1950	1951	1950	1951	1950	1951
UNITED STATES	**44,986,394**	**46,588,910**	**39,132,695**	**40,649,605**	**5,466,181**	**5,559,201**	**234,788**	**240,218**	**156,690**	**161,786**
New England	**3,007,490**	**3,174,630**	**2,609,471**	**2,770,133**	**368,710**	**374,218**	**18,760**	**18,354**	**10,557**	**11,885**
Maine	311,487	324,389	266,124	277,390	37,965	39,480	4,128	4,303	3,270	3,309
New Hampshire	198,639	205,887	173,381	179,763	22,117	23,044	747	681	2,394	2,459
Vermont	124,895	128,720	109,034	112,472	14,035	14,952	755	784	1,071	1,112
Massachusetts	1,533,260	1,567,514	1,336,744	1,369,288	185,773	186,384	7,589	7,627	3,154	4,215
Rhode Island	258,423	265,858	226,193	233,026	30,423	30,995	1,375	1,402	432	435
Connecticut	660,854	682,329	577,995	98,194	78,397	79,423	4,166	4,357	296	355
Middle Atlantic	**9,531,104**	**9,761,879**	**8,188,211**	**8,395,577**	**1,207,877**	**1,228,083**	**38,937**	**40,866**	**96,569**	**97,433**
New York	4,790,289	4,875,263	4,075,361	4,154,956	691,447	696,210	7,368	7,509	16,113	16,588
New Jersey	1,602,970	1,672,657	1,382,187	1,448,088	210,823	214,310	8,007	8,223	1,953	2,036
Pennsylvania	3,137,845	3,213,959	2,700,773	2,792,533	405,007	387,483	23,562	25,134	8,503	8,809
East North Central	**9,476,091**	**9,727,518**	**8,331,422**	**8,575,092**	**1,078,306**	**1,072,247**	**34,175**	**47,733**	**31,788**	**32,486**
Ohio	2,475,250	2,537,830	2,175,467	2,240,698	275,373	271,483	11,993	12,611	12,417	13,038
Indiana	1,267,181	1,318,190	1,110,811	1,153,499	141,975	144,078	7,944	8,171	6,451	6,448
Illinois	2,633,133	2,675,750	2,294,038	2,333,889	322,323	312,640	9,154	21,661	7,618	7,560
Michigan	1,993,871	2,065,614	1,770,461	1,838,055	217,630	221,609	3,012	3,143	2,768	2,807
Wisconsin	1,106,656	1,136,204	980,845	1,008,981	121,205	122,443	2,072	2,147	2,534	2,633
West North Central	**4,353,760**	**4,509,096**	**3,789,220**	**3,936,797**	**535,614**	**542,861**	**15,576**	**15,865**	**13,330**	**13,503**
Minnesota	971,404	1,006,205	854,807	888,705	112,963	113,958	1,369	1,429	2,265	2,113
Iowa	849,577	870,620	731,360	750,656	109,394	111,016	6,720	6,718	2,113	2,230
Missouri	1,179,436	1,222,726	1,036,845	1,078,733	137,618	138,785	2,535	2,645	2,438	2,563
North Dakota	166,088	177,293	141,202	151,896	24,304	24,885	47	55	535	527
South Dakota	178,870	190,312	151,691	162,791	26,297	26,630	60	59	822	832
Nebraska	403,416	418,016	346,584	359,621	53,163	54,627	790	797	2,879	2,971
Kansas	604,949	623,854	526,731	544,465	71,945	72,960	4,055	4,162	2,218	2,267
South Atlantic	**5,500,635**	**5,790,046**	**4,842,781**	**5,113,592**	**611,111**	**637,813**	**28,349**	**28,377**	**18,424**	**19,044**
Delaware	101,525	108,043	88,235	94,341	12,758	13,160	401	411	131	131
Maryland, District of Columbia	836,659	870,495	724,497	756,678	105,842	108,212	5,813	5,076	507	529
Virginia	811,003	851,019	715,033	752,321	88,687	91,055	1,324	1,423	5,959	6,220
West Virginia	522,903	542,944	460,519	479,636	57,559	57,885	1,906	2,423	2,919	3,000
North Carolina, South Carolina	1,552,671	1,661,376	1,388,510	1,489,676	147,406	163,222	12,495	4,165	4,260	4,313
Georgia	823,224	867,695	731,207	773,796	89,257	91,039	1,669	1,736	1,091	1,124
Florida	852,650	888,474	734,750	767,144	109,602	112,440	4,741	5,163	3,557	3,727
East South Central	**2,716,285**	**2,832,561**	**2,438,795**	**2,543,170**	**252,385**	**260,267**	**10,723**	**11,844**	**14,378**	**15,280**
Kentucky	717,357	748,247	639,257	668,323	70,177	71,876	3,043	2,840	4,880	5,108
Tennessee	824,339	869,043	737,974	781,580	77,756	78,446	2,347	2,591	6,262	6,596
Alabama	725,075	752,515	658,447	683,879	62,013	63,713	2,997	3,234	1,618	1,689
Mississippi	449,514	462,716	403,117	409,448	42,439	46,232	2,346	3,149	1,618	1,887
West South Central	**3,902,130**	**4,074,962**	**3,412,895**	**3,577,063**	**442,332**	**449,045**	**31,194**	**32,105**	**15,709**	**16,749**
Arkansas	465,181	482,254	416,407	432,439	45,350	46,241	2,474	2,584	950	990
Louisiana	670,917	702,039	586,334	615,877	76,713	78,052	5,376	5,514	2,494	2,596
Oklahoma	641,175	662,750	560,342	582,460	71,487	70,419	6,311	6,660	3,035	3,211
Texas	2,124,857	2,227,919	1,849,812	1,946,287	248,782	254,333	17,033	17,347	9,230	9,952
Mountain	**1,488,402**	**1,562,591**	**1,287,779**	**1,355,131**	**180,873**	**184,979**	**15,572**	**17,389**	**4,378**	**4,792**
Montana	181,282	187,011	156,186	161,470	21,813	22,183	2,766	2,800	517	558
Idaho	196,366	202,461	169,889	174,167	25,376	27,111	703	877	298	306
Wyoming	81,903	86,049	70,668	74,454	9,643	9,930	1,445	1,506	153	159
Colorado	408,098	431,553	348,954	371,505	49,138	49,717	8,487	8,515	1,579	1,816
New Mexico	166,775	178,709	145,570	157,320	19,947	20,098	667	680	591	611
Arizona	203,846	217,604	175,031	187,167	28,247	28,856	120	1,037	448	544
Utah	200,816	206,145	180,883	185,719	17,906	17,868	1,353	1,880	674	678
Nevada	49,616	52,759	40,604	43,329	8,803	9,216	91	94	118	120
Pacific	**4,930,309**	**5,155,997**	**4,177,841**	**4,383,090**	**489,373**	**508,669**	**41,432**	**43,685**	**21,563**	**20,614**
Washington	760,026	784,298	674,145	692,232	81,132	86,888	2,926	3,215	1,823	1,963
Oregon	503,182	520,501	434,333	446,305	63,545	69,871	2,691	2,239	2,613	2,086
California	3,667,001	3,851,198	3,069,363	3,244,553	344,696	351,909	35,815	38,171	17,127	16,565

Source: Edison Electric Institute.
*1951 customers as of November 1, 1951. †Includes Street and Highway Lighting, Other Public Authorities, Railways and Railroads and Interdepartmental.

and their percentage increases are the lowest, 2.66 and 2.42 respectively. Fourth highest increase in number (226,000) and third highest in percentage (4.6) was the Pacific region. The Mountain region was lowest in numerical increase (73,000) and second from the top in percentage (4.88).

There was a considerable reclassification of customers in 1951. A number of utilities, one of them very large, went through their books and shifted customers from one rate schedule to another. This is the reason why the data in the two tables presented here do not correspond. The large table includes reclassifications and the small one does not; it shows net additions. Thus the difference between 1950 and 1951 residential and rural customers in the large table (1,520,910) does not agree with the sum of residential and rural customer additions in the small one (1,494,840). Cause of this is transfer of former small light and power customers to a residential rate and some farms to a small light and power rate.

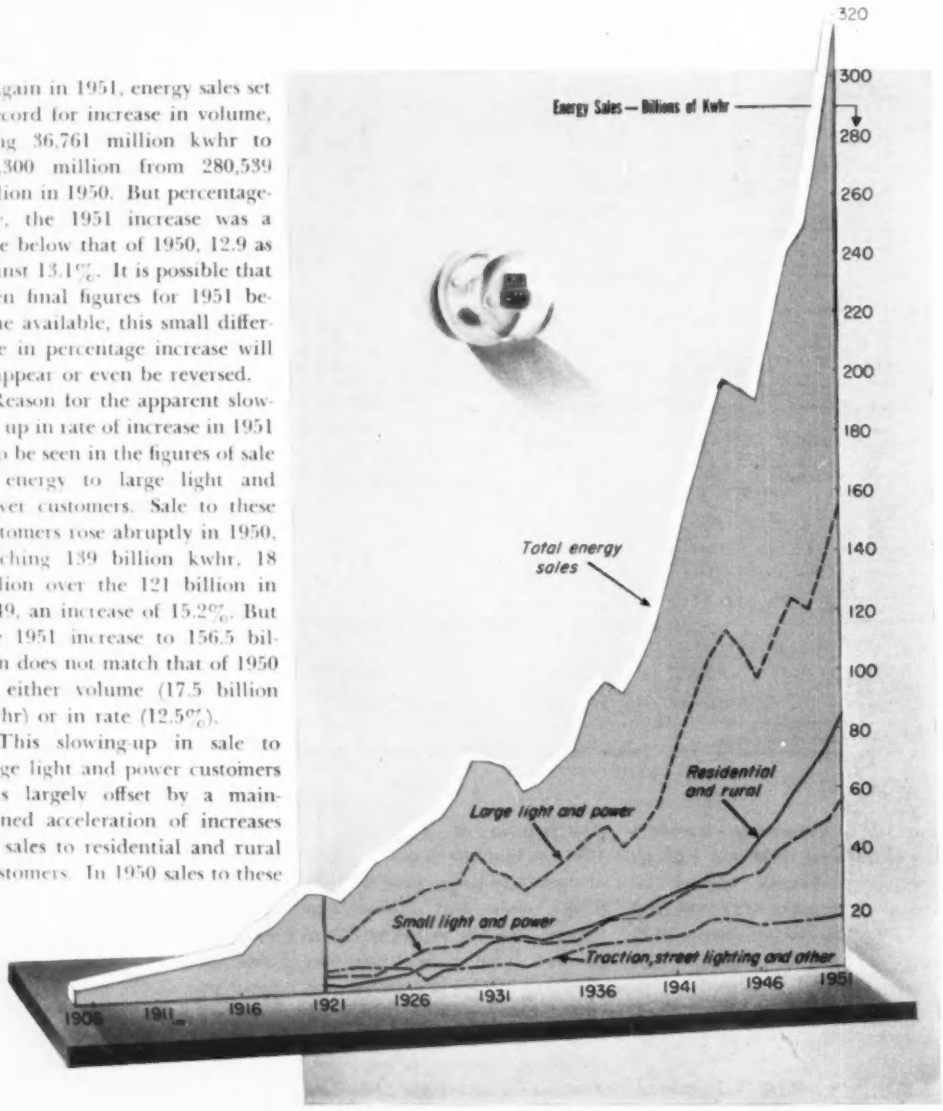
Total Reaches 317.3 Billion Kwhr

Large rises in usage by commercial, residential and rural customers counterbalance apparent slow-up in rate of increase of sales to large light and power customers

Again in 1951, energy sales set a record for increase in volume, rising 36,761 million kwhr to 317,300 million from 280,539 million in 1950. But percentage-wise, the 1951 increase was a little below that of 1950, 12.9 as against 13.1%. It is possible that when final figures for 1951 become available, this small difference in percentage increase will disappear or even be reversed.

Reason for the apparent slowing up in rate of increase in 1951 is to be seen in the figures of sale of energy to large light and power customers. Sale to these customers rose abruptly in 1950, reaching 139 billion kwhr, 18 billion over the 121 billion in 1949, an increase of 15.2%. But the 1951 increase to 156.5 billion does not match that of 1950 in either volume (17.5 billion kwhr) or in rate (12.5%).

This slowing-up in sale to large light and power customers was largely offset by a maintained acceleration of increases in sales to residential and rural customers. In 1950 sales to these

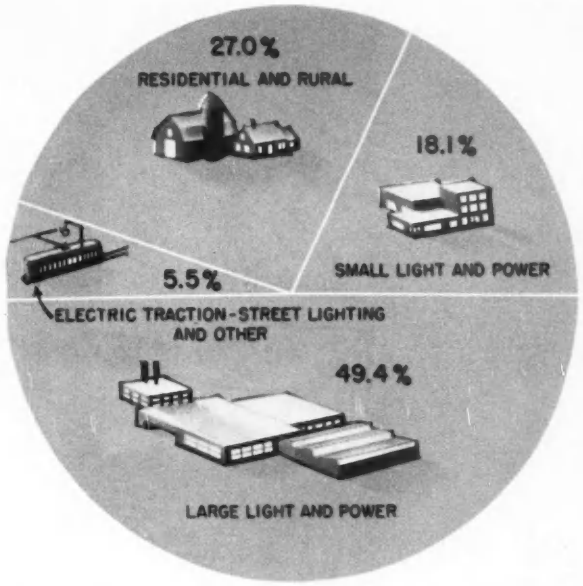


customers rose to 74,430 million kwhr from 65,523 million in 1949, a 13.6% increase. The 1951 figure of 85,850 million kwhr is 11,420 million, 15.4%, above that of 1950.

The data in the table on sales to residential and rural customers are added together for consideration in this discussion for two reasons. One is that the table data include only those rural customers served on distinct rural rates. Many utilities serve these customers on the same rate schedules as they do residential customers. Thus the column headings in the table do not make clear distinction between rural and residential customer sales. The second reason is that the greater part, probably around 80%, of the electricity taken by American farms is used in the farm home. Until much larger use than now is made of electricity in farm production operations (See "Future Farm Market Heads for Record Growth," Electrical World, December 3, 1951) it will be permissable to regard rural and residential customers as one group in respect to energy sales.

Helping to offset the deceleration of increase in sale to large light and power (industrial) customers in 1951 was a major increase in sale to commercial customers, designated as small light and power in the table. Sales to these customers increased 9% in 1950 over 1949. In 1951 the increase was 14%. This much larger increase in 1951 from 46 billion kwhr sale in 1949 to 50 billion in 1950 and then to 57 billion in 1951—cannot be accounted for by increase in number of commercial customers. More of these customers were added in 1950 than in 1951. The only explanation appears to be that the average commercial customer used considerably more electricity in 1951 than in 1950. Perhaps the general change in retail trade from a sellers' market in 1950 to a buyers' market in 1951 was an influence here.

In the national total of electricity sales, the quantity sold for street and highway lighting is very small, less than 2%. But the consistently accelerating increase year by year since the war—for 1946-1951—offers convincing testimony of the effectiveness of the promotional effort that has been put on street and highway lighting in recent years.

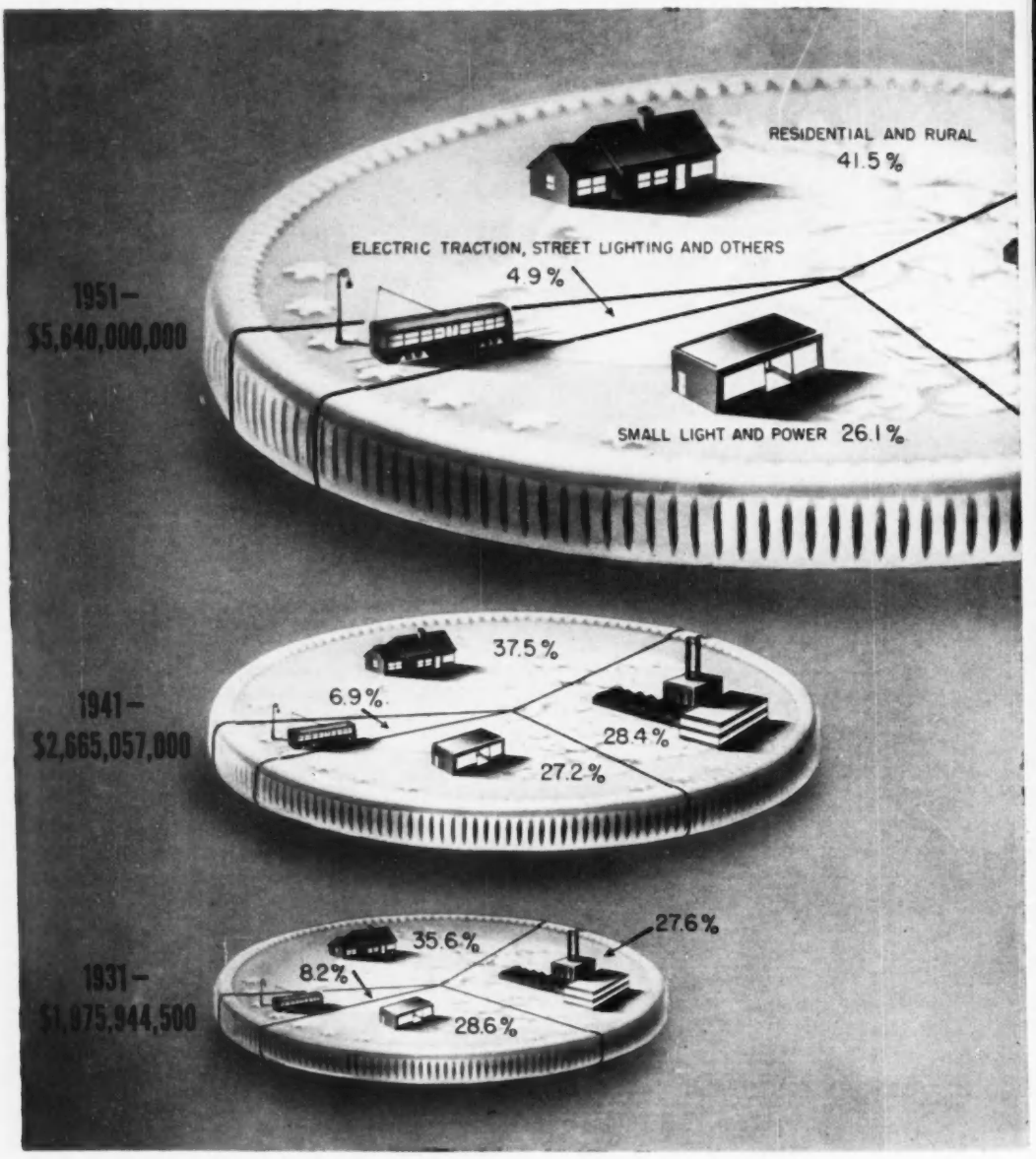


PROPORTION OF TOTAL SALES to various classes of customers, during 1951, shows large light and power is biggest, with a total of 156.5 billion kwhr, up 12.5%

Energy Sales to Ultimate Consumers
(In Millions of Kwhr)

Year	Rural*	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Other Public Authorities	Electric Traction	Interdepartmental	Total to Ultimate Consumers
1938..	1,577	19,371	19,137	43,140	1,929	2,451	5,438	688	93,731
1939..	1,881	21,084	20,722	51,108	2,002	2,538	5,765	667	105,768
1940..	1,991	23,318	22,373	59,557	2,048	2,720	5,909	727	118,643
1941..	2,352	25,124	24,628	76,060	2,111	3,093	6,078	614	140,060
1942..	2,890	26,937	27,234	88,378	2,061	4,206	6,628	1,074	159,408
1943..	2,996	28,621	28,192	106,657	2,075	9,139	7,226	983	185,889
1944..	3,373	31,266	29,837	115,187	2,163	8,463	7,329	543	198,161
1945..	3,668	34,184	30,438	107,490	2,184	7,589	7,354	650	193,558
1946..	4,431	38,571	33,016	98,885	2,272	5,854	7,147	619	190,794
1947..	5,551	44,171	38,379	113,523	2,365	5,916	7,104	571	217,581
1948..	6,327	50,978	43,193	124,088	2,525	6,255	6,720	654	240,740
1949..	7,384	58,139	46,262	120,766	2,726	6,583	6,112	570	248,542
1950..	7,400	67,030	50,446	139,065	2,976	7,163	5,882	578	280,539
1951**	8,650	77,200	57,450	156,500	3,300	7,925	5,750	525	317,300

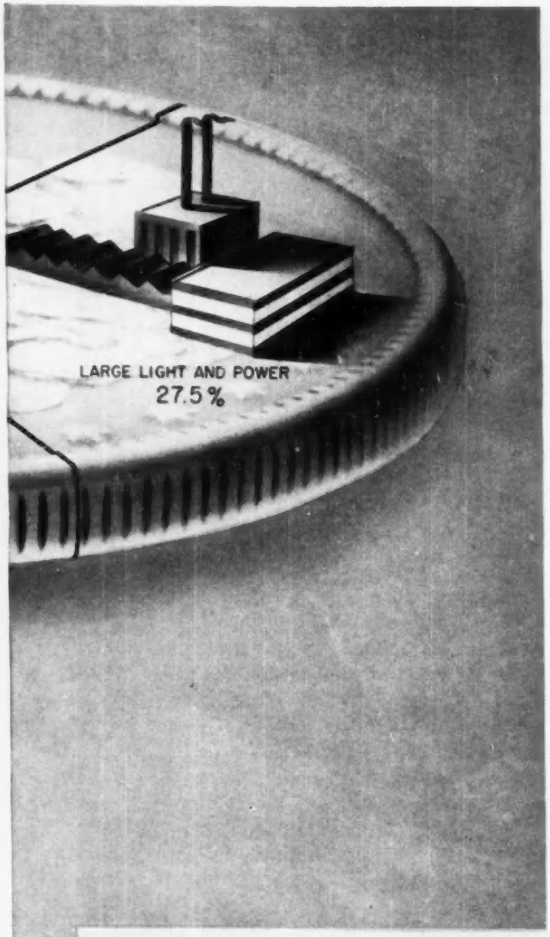
Source: Edison Electric Institute. * Sales on distinct rural rates. ** Estimated.

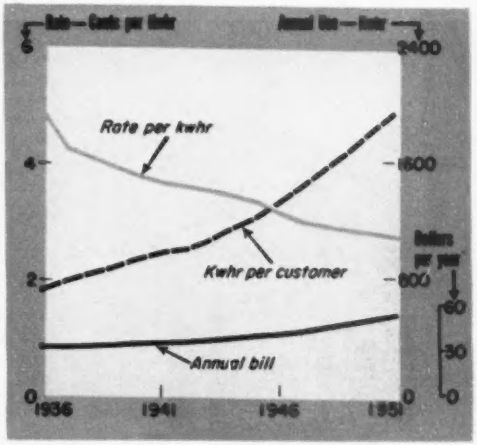


Revenue Up—Net Income Down

Revenue from industry-wide sales of electricity during 1951 was $5,640 million—a 10.9% increase over the $5,087 received during 1950.

Net income of electric utility companies during 1951 was $814 million—a 2% decrease from the $831 million earned during 1950.





Averages for Residential Service

Year	Kwhr per Customer	Average Annual Bill (Dollars)	Rate per Kwhr (Cents)
1938	853	35.31	4.14
1939	897	35.88	4.00
1940	952	36.56	3.84
1941	986	36.78	3.73
1942	1,022	37.51	3.67
1943	1,070	38.52	3.60
1944	1,151	40.40	3.51
1945	1,229	41.97	3.41
1946	1,329	42.79	3.22
1947	1,438	44.43	3.09
1948	1,563	47.05	3.01
1949	1,684	49.68	2.95
1950	1,830	52.70	2.88
1951*	2,000	56.50	2.83

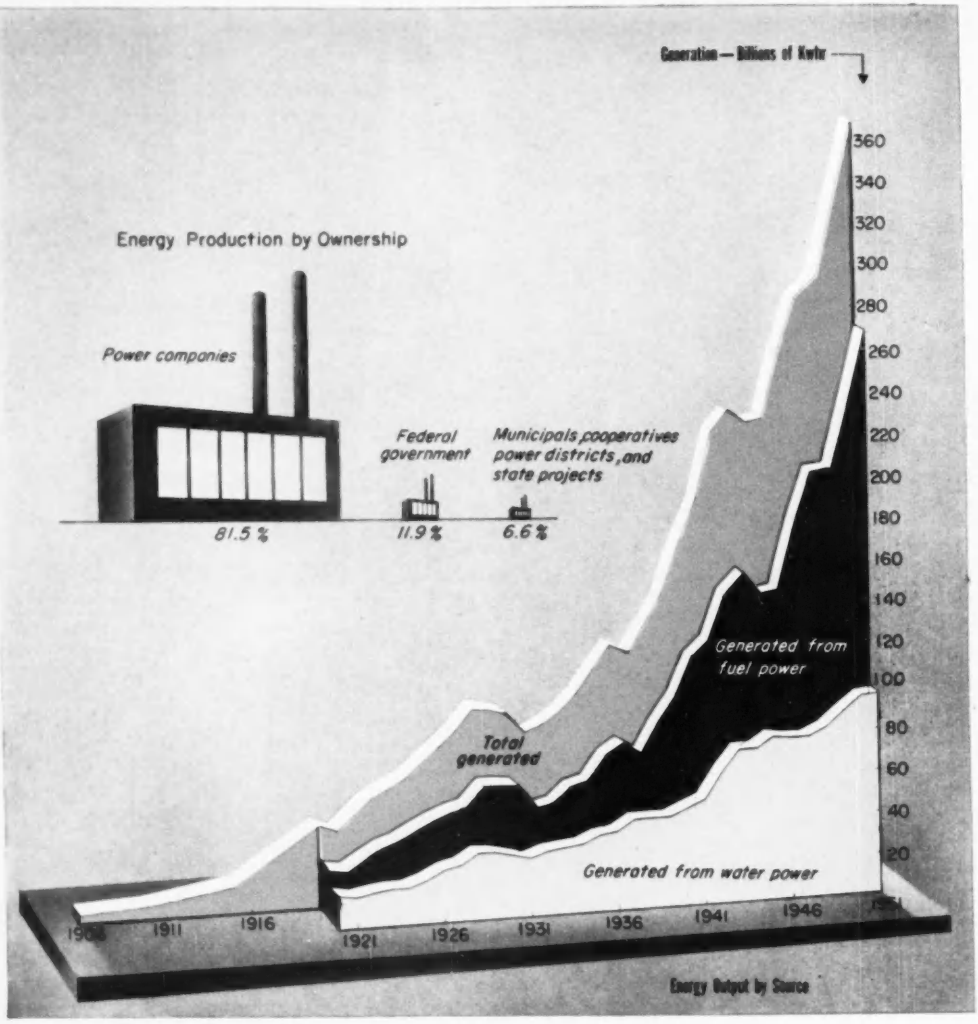
Source: Edison Electric Institute. * Estimated.

Revenue from Electricity Sales

(Thousands of Dollars)

Year	Rural*	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Other Public Authorities	Electric Traction	Inter-departmental	Total from Ultimate Consumers
1938	38,928	802,532	632,091	518,694	74,323	40,195	45,507	4,311	2,156,580
1939	45,484	843,158	660,683	572,659	75,443	40,796	47,000	4,360	2,289,583
1940	49,473	895,951	689,253	631,428	76,052	45,515	47,808	4,737	2,440,218
1941	64,396	938,229	725,117	758,083	76,949	49,203	48,945	4,136	2,665,057
1942	75,027	990,185	767,279	828,318	75,660	60,206	53,632	5,536	2,885,843
1943	76,617	1,029,260	773,678	964,192	75,384	94,958	58,098	5,457	3,077,643
1944	82,842	1,097,726	817,355	1,043,392	76,626	94,452	60,274	4,085	3,276,752
1945	90,344	1,167,356	850,213	1,001,957	76,189	88,854	61,464	5,141	3,341,518
1946	104,876	1,240,577	924,775	969,348	77,570	77,047	60,288	5,078	3,459,560
1947	123,748	1,366,498	1,031,335	1,106,555	78,181	78,319	63,035	5,093	3,852,765
1948	140,648	1,532,663	1,152,783	1,250,684	82,391	84,890	63,551	5,712	4,313,313
1949	160,855	1,716,533	1,228,726	1,262,698	88,087	91,067	60,752	5,351	4,614,069
1950	158,000	1,932,000	1,334,000	1,405,000	94,000	100,000	59,000	5,000	5,087,000
1951**	176,000	2,175,000	1,465,000	1,550,000	103,000	109,000	57,000	5,000	5,640,000

Source: Edison Electric Institute. * Distinct rural rates only. ** Estimated.



370 Billion Kwhr Produced

Biggest rise of any year. But rate of increase remains about the same as in 1950

Maybe the rate of increase in generation of electricity for the public supply slowed up a little in 1951. Based on the estimated 1951 generation of over 370 billion kw-hr reported here, the rate was 12.9% as against 13% in 1950. The reason for this is that sale of electricity for industrial use did not increase as much in 1951 as in 1950. Almost counterbalancing this was an accelerated increase in sales to residential and rural customers in 1951.

Source and Disposal of Energy

(In Millions of Kwhr)

Year	Generated from		Total Generation	Add Imports from Canada	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
	Fuel Power	Water Power						
1936	70,258	39,058	109,316	1,054	5,826	104,544	14,500	90,044
1937	74,900	44,013	118,913	1,733	6,428	114,218	14,859	99,359
1938	69,533	44,279	113,812	1,867	6,990	108,689	14,958	93,731
1939	84,078	43,564	127,642	1,900	7,734	121,808	16,040	105,768
1940	94,516	47,321	141,837	937	7,268	135,506	16,863	118,643
1941	113,925	50,863	164,788	927	6,335	159,380	19,320	140,060
1942	122,108	63,871	185,979	1,448	6,611	180,816	21,409	159,407
1943	144,127	73,632	217,759	1,537	9,729	209,567	24,678	185,889
1944	154,244	73,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	148,516	79,970	229,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,314	78,425	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,099	1,004	5,887	286,216	37,675	248,542
1950	233,116	95,882	328,998	1,283	8,445	321,979	41,440	280,539
1951*	272,414	98,122	370,536	1,500	9,000	363,000	45,700	317,300

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad and Railway classifications. * Estimated.

By far the greater part of the 1951 increase in generation came from fuel power plants. The proportion of hydro generation, which has been declining for the past decade, continued the trend in 1951, was down to 26.5%.

The ratios of generations in Census regions to the national total remained practically the same last year as in 1950. Perhaps the slight increases of about ½% that brought the West South Central and Pacific regions up to 7.3 and 14.9% respectively are indications of growing production of airplanes for defense.

Plants of power companies produced about the same proportion in the national total of electricity generated in 1951 as in 1950, 81.5% as against 81.2%.

Production of Electric Energy by Ownership

(In Millions of Kwhr)

Year	Power Companies	Local†	Federal	Total Local and Federal
1937	110,464	6,606	1,843	8,449
1938	104,090	6,693	3,029	9,722
1939	115,078	7,088	5,476	12,564
1940	125,411	7,842‡	8,584	16,426
1941	144,290	9,705	10,794	20,498
1942	158,052	11,034	16,893	27,928
1943	180,247	13,027	24,484	37,511
1944	185,850	13,473	28,866	42,339
1945	180,926	13,559	28,001	41,560
1946	181,020	15,198	26,960	42,158
1947	208,105	17,757	29,877	47,634
1948	228,231	19,094	35,373	54,467
1949	233,112	19,885	38,102	57,987
1950	266,823	21,877	40,298	62,175
1951*	302,108	24,317	44,111	68,428

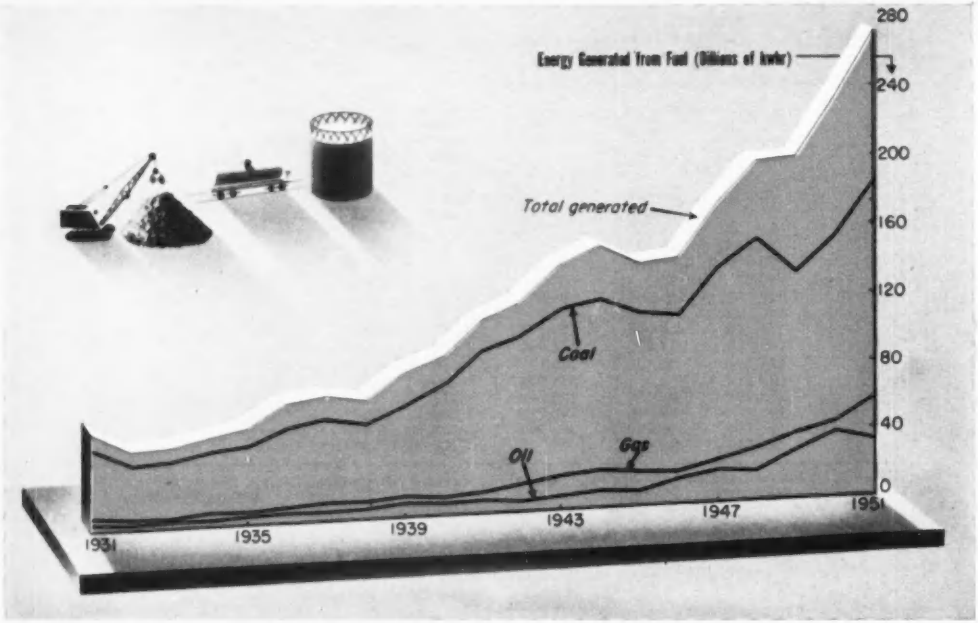
Source: Federal Power Commission.
* Estimated. † Includes municipals, cooperatives, power districts and state projects. ‡ 1940 and following data revised to exclude production by publicly owned transit systems.

Energy Production by Regions

(In Millions of Kwhr)

Region	1948			1949			1950			1951*		
	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel
New England	14,341	3,026	11,315	14,275	3,218	11,057	16,195	3,672	12,523	17,572	4,199	13,373
Mid. Atlantic	57,432	9,064	48,368	56,933	9,038	47,895	63,366	9,985	53,381	70,085	9,849	60,236
E. No. Central	65,141	2,498	62,643	66,253	2,748	63,504	75,319	3,329	71,990	84,466	4,384	80,082
W. No. Central	16,250	2,312	13,939	17,486	2,833	14,653	19,183	2,870	16,314	20,993	3,423	17,570
So. Atlantic	36,089	9,326	26,763	36,973	11,044	25,929	43,611	9,275	34,336	49,750	7,171	42,579
E. So. Central	21,242	13,011	8,231	21,824	16,097	5,727	24,588	15,608	8,982	27,450	14,266	13,184
W. So. Central	17,794	1,022	16,771	19,429	1,350	18,080	22,485	1,370	21,114	27,127	1,311	25,816
Mountain	14,808	11,661	3,147	15,444	12,012	3,432	16,487	12,388	4,098	17,574	12,379	5,195
Pacific	39,601	30,550	9,051	42,483	31,409	11,074	47,764	37,385	10,378	55,519	41,140	14,379
United States	282,698	82,470	200,228	291,099	89,748	201,351	328,998	95,882	233,116	370,536	98,122	272,414

Source: Federal Power Commission. * Estimated.



OUTPUT from oil decreased sharply during 1951 despite large increase in generation from fuel. Chief reason for this was increased cost of oil in relation to that of coal and gas. Consumption of oil is, however, still more than three times as great as it was six years ago

Coal Rate Hits Low of 1.17 lb

Utilities now require an average of 1.17 lb of coal or equivalent in gas or oil to produce a kwhr

Output from Fuel and Fuel Used

Year	Energy Generated From Fuel† (Millions of Kwhr)	Fuel Consumed				
		Coal (Millions of Tons)	Oil (Millions of Bbl)	Gas (Billions of Cu Ft)	Coal Equiv.†† (Millions of Tons)	Pounds of Coal per Kwhr†
1939	83,628	44.54	17.14	188.88	57.60	1.38
1940	93,963	51.47	16.33	180.10	62.94	1.34
1941	113,272	62.67	20.08	201.76	75.70	1.34
1942	121,585	66.26	15.24	235.21	79.08	1.30
1943	143,785	77.30	17.99	301.94	93.27	1.30
1944	153,868	80.08	20.86	358.78	99.25	1.29
1945	142,331	74.72	20.23	326.21	92.64	1.30
1946	144,555	72.20	36.32	306.94	93.47	1.29
1947	176,983	89.53	45.31	373.05	115.67	1.31
1948	199,796	99.59	42.64	478.10	130.12	1.30
1949	200,965	83.96	66.30	550.12	124.57	1.24
1950	232,813	91.87	75.42	628.92	138.42	1.19
1951*	265,750	104.52	63.83	748.66	155.32	1.17

Source: Federal Power Commission. * Twelve months ended October 31.
† Output by use of wood not included, except for small amount in 1950. †† Coal plus oil plus gas.

Average coal rate has hit a new low. It now requires an average of only 1.17 lb of coal (or equivalent in gas or oil) to produce a kwhr.

Significant is the fact that the average unit consumption of our fuels for the generation of electricity is now at a rate 13% lower that it was a decade ago. In 1941, we averaged 1.34 lb of coal to produce a kwhr.

For the seven years preceding 1949 this figure had remained nearly constant, hovering around 1.30. During 1949, a year in which a record increase in generating capacity was made, the average coal rate dropped to

1.24. Large increments of new generating capacity installed since 1949 have resulted in a further reduction.

This is the result of three factors. One is that the efficiency of generation has greatly increased through the use of improved equipment and superior cycles.

The second is due to quantity of generating capacity added. Finally, improved load factors bring in a larger percentage of the most efficient capacity.

A 16.2% increase in energy generated from fuel accompanied by a 2.3% increase in hydro generation resulted in an overall increase of 12.2% in generation.

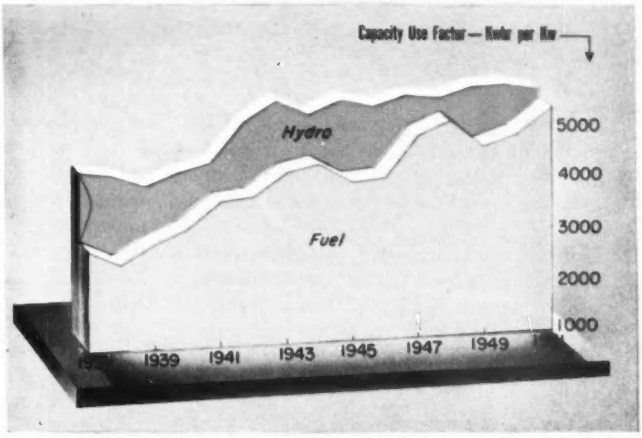
Consumption of oil decreased sharply during 1951, despite the large increase in generation from fuel. This was due to a change in relative cost compared with coal and gas. There was a 14% increase in the use of coal and a 19% increase in the use of gas. Consumption of oil is, however, still more than three times as great as it was six years ago.

Nearly one third of the nation's generation is now from other fuel than coal, ten years ago other fuel represented only 17% of the total.

Consumption of coal has nearly doubled in eleven years, that of gas nearly doubled in four years.

The year 1951 brought about an increase in the requirements imposed on steam generation. Use of fuel-consuming capacity rose to 5,090 kwhr per kilowatt, making it the second largest.

In 1951, 76% of the total capacity required fuel. With it was generated 74% of the nation's energy. In 1941, 71% of the nation's generating capacity was based on fuel, with it was generated 69% of total energy.



Use of fuel-consuming capacity rose to 5,090 kwhr per kw, second largest usage on record. The year 1951 was not, however, an outstandingly favorable year from the hydro standpoint

Output, Capacity, Average Use

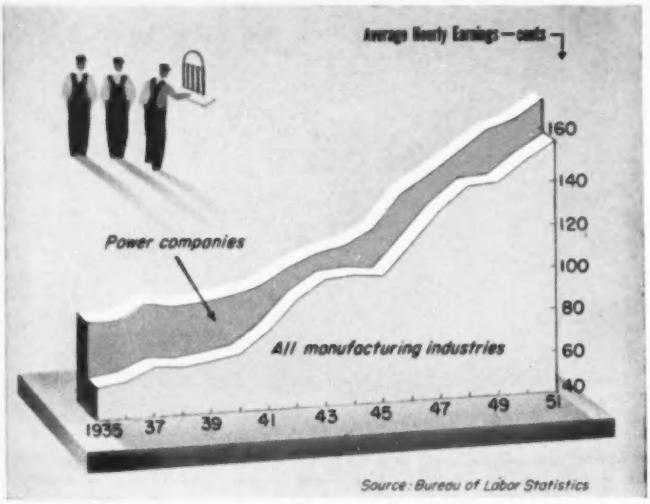
Year	Energy Generated (Millions of Kwhr)			Generating Capacity at end of year (Thousands of Kw)†			Output per Kw Of Average Capacity		
	Fuel	Water	Total	Fuel	Water	Total	Fuel	Water	Total
1938...	71,847	44,834	116,681	27,976	11,066	39,042	2,635	4,143	3,063
1939...	86,314	44,022	130,336	28,903	11,415	40,318	3,035	3,916	3,285
1940...	97,232	47,753	144,985	29,964	11,675	41,639	3,303	4,137	3,538
1941...	116,908	51,262	168,170	31,828	12,264	44,092	3,784	4,284	3,923
1942...	125,002	64,179	189,181	33,381	13,025	46,407	3,834	5,076	4,181
1943...	147,027	73,943	220,970	35,237	14,068	49,305	4,285	5,458	4,617
1944...	156,704	74,032	230,736	35,671	14,604	50,275	4,392	5,164	4,634
1945*..	142,516	79,970	222,486	35,199	14,912	50,111	4,021	5,419	4,433
1946...	144,772	78,406	223,178	35,468	14,849	50,317	4,097	5,262	4,445
1947...	177,314	78,425	255,739	37,351	14,971	52,322	4,870	5,442	4,983
1948...	200,228	82,470	282,698	40,908	15,652	56,560	5,117	5,386	5,193
1949...	201,351	89,748	291,099	46,447	16,654	63,100	4,610	5,556	4,865
1950...	233,202	95,938	329,141	51,244	17,675	68,919	4,770	5,600	5,030
1951**.	272,414	98,122	370,536	55,937	18,739	74,678	5,090	5,390	5,150

Source: Federal Power Commission. * 1945 and following data revised to exclude former Mining and Manufacturing and Railroad and Railway classifications. † 1951 data to November 1, 1951.

Average use of capacity ratios, i. e. output generated per kw of average capacity, signify that every kw of hydro capacity was, on the average, in service at name plate capacity for 62% of the time. Every kw of fuel consuming capacity, 58% of the time.

The year 1951 was not, however, an outstanding favorable year from the hydro standpoint. In fact the years, 1943, 1945, 1947, 1949 and 1950 all afforded water sustaining longer hours of operation than the 5,390 hours of 1951.

Hydro capacity, because of its lower production costs, has always been used to the fullest possible extent. Increased demand for energy during prewar, war, and postwar years has brought with it increased use of fuel-consuming capacity. This is witnessed by the fact that since 1941 the average use of fuel-consuming capacity has risen almost 35%. During the same period that of hydro increased 26%.



EARNINGS RECEIVED by power companies' employees hit a record high in 1951 and since V-J Day have gone up faster than the rise in the Consumers' Price Index

Employment, Wages Set Record

In 1951 wages went over the $1 billion mark for the first time. They will amount to $1,017 million in 1951 as compared with $928 million in 1950, an increase of 9.6%.

Hourly Earnings Set Record . . . Average hourly earnings hit a new record high of $1.73 per hour, a gain of 10.4¢ from 1950 even though wages were controlled under the Defense Production Act. This compared with an increase of 6.6¢ an hour in 1950 and 9.5¢ in 1949.

Wages and Hours Worked

	Average Hourly Earnings (Cents)	Average Weekly Earnings (Dollars)	Average Weekly Hours	Estimated Number of Employees* (Thousands)
1935	80.5	32.10	40.0	.....
1936	81.9	33.00	40.7	.....
1937	87.3	34.94	40.1	.....
1938	86.1	34.33	40.0	.....
1939	87.1	34.64	39.7	.....
1940	90.4	35.37	39.1	.....
1941	94.0	37.73	40.3	.....
1942	102.2	41.94	40.8	.....
1943	107.8	46.48	42.9	.....
1944	111.9	48.84	43.3	.....
1945	118.6	50.49	42.0	.....
1946	133.7	54.58	41.4	.....
1947	137.1	57.44	41.9	213.0
1948	146.9	61.70	42.0	226.4
1949	156.4	64.91	41.5	233.5
1950	163.0	67.81	41.6	234.0
1951‡	173.4	73.18	42.1	234.4

Source: Bureau of Labor Statistics. * Covers employees in the electrical divisions of privately owned power companies only. Data prior to 1947 not available. ‡ Estimated.

More Employees . . . The number of electric utility employees in the electrical divisions of privately owned power companies also went to a record 234,400 at the end of 1951, as compared with 234,000 in 1950. A recent Bureau of Labor Statistics study showed 28% of the total employment of industry was engaged in clerical duties.

Earnings Higher Than CPI . . . Since V-J Day, average hourly wages in the electric utility industry have gone up faster than the rise in the Consumers' Price Index. The earnings reported by the Bureau of Labor Statistics for the industry include a small amount of overtime pay and premium pay to shift employees. However, this will not materially affect the comparison between earnings and the index.

As of Sept. 15, 1951, the index stood at 186.5 as compared with 129.3 on Aug. 15, 1945, an increase of 44.2%. Average hourly earnings as reported by the Bureau of Labor Statistics during the same period was 174.8¢ versus 113.9¢, an increase of 53.4%. Thus, the employees in the industry received on the average 9.2% more than

the rise in the Consumers' Price Index since V-J Day.

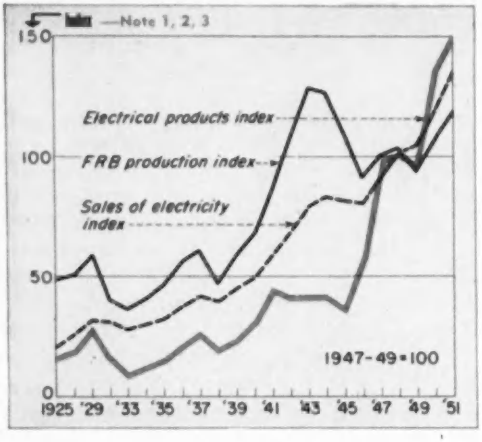
Fringes Are Higher . . . Pensions and other fringe adjustments (such as vacations, holidays, sick leave, insurance, etc.) have been a common practice in the industry for many years. In a recent study, "Wage Structure—Electric and Gas Utilities, 1950", the Bureau of Labor reported that all companies studied provided "some type of insurance or pension plan—the cost of which was paid, at least in part, by the company. Nearly all workers were eligible for life insurance and retirement pension benefits. Health insurance and hospitalization plans were also prevalent in the industry." An analysis of some of the union contracts with electric companies reveal that these benefits amount to some 20% on top of the hourly earnings received by the employees.

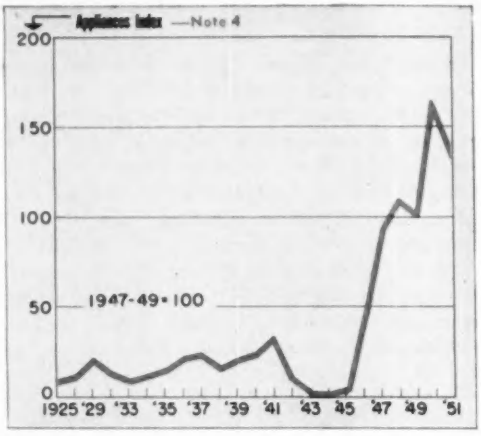
Stable Employment . . . With a relatively small variation from the 40 hour week, stable employment is a characteristic of this industry. Steel, auto and other basic industries are characterized by wide fluctuations in employment and hours worked which have given rise to the demand for a guaranteed wage. In the electric utility industry, the inherent stability of employment and hours worked has made the goal of the guaranteed annual wage a purely academic question.

Labor Contracts and Terms—1951

Company	Union	Effective Date	Workers Covered	Wage Increase, Other Benefits
Arkansas P & L	IBEW	.....	.....	$10-20/mo
Bangor Hydro-Electric	IBEW	1/ 1/51	.....	4-12¢
Beech Bottom Power	UWU	.....	.....	5% and 7½¢, 2x pay Sun; ls
California Electric Pwr	IBEW	12/ 1/50	500	16¢ or 10%‡
California Oregon Power	IBEW	1/ 1/51	.....	5%
California-Pacific Utilities	IBEW	2/ 1/51	.....	5%
Central Illinois Light	IBEW	7/ 1 51	625	5½% (av. 9¢)
Citizens Electric	IBEW	2/ 5/51	.....	15%
Citizens Utilities, Ariz	IBEW	2/ 1/51	.....	5-10¢
Cleveland Electric Illuminating	UWU	4/ 1/51	2,800	6½¢; ad ½¢(WSB); ad 7½¢
Connecticut Power	IBEW	5/ 1/51	400	5%; hs
Consolidated Edison	UWU	7/ 1/51	27,000	5¢ m; 5¢ progression
Consumers Power, Mich	UWU	1/29/51	4,400	9-11¢; 3 wks vc/15 y (20)
Dallas Power & Light	IBEW	3/11/51	.....	4½%
Dayton Power & Light	UWU	5/16/51	2,100	Ad. 5¢
Delaware Power & Light	IBEW	3/15/51	325	5%
Detroit Edison	UWU	1/ 1/51	4,500	2¢ cl
		6/ 1/51		4¢
	IBEW	1/ 1/51	1,000	2¢ cl
		6/ 1/51	.....	4¢
Eastern Shore Public Service	IBEW	1/ 1/51	.....	3½% (WSB)
	IBEW	6/ 51	500	4½%; ad hol (8)
El Paso Electric	IBEW	1/ 1 51	.....	4%
Florida Power Corp	IBEW	1/22/51	.....	2½%
		7/23/51	.....	2%
Georgia Power & Light	IBEW	1/22/51	.....	2½%
		7/23/51	.....	2%
Green Mountain Power	IBEW	1/14/51	.....	4¢
Houston Lighting & Power	IBEW	10/ 6/51	850	9.6%
Interstate Power Co	IBEW	1/ 1/51	.....	3½%
	IBEW	4/ 1/51	.....	3½%
Kansas City Power & Light	IBEW	7/51	1,800	9½¢
Kansas Gas & Electric	IBEW	3/27/51	.....	5%
Kansas Power & Light	IBEW	10/51	1,200	7%
Mason County PUD #1 & 3	IBEW	.....	.....	10¢
Metropolitan Edison	IBEW	1/ 1/51	1,000	6-12¢
Metropolitan Utilities District, Omaha, Neb	.....	10/ 1/51	950	$20/mo(av 7.4%)
Minnesota Power & Light	.....	6/ 1/51	250	$5.56 interplant ls
Missouri Edison	IBEW	1/ 1 51	.....	8-10¢
Missouri Power & Light	IBEW	4/ 2 51	.....	6½¢
		10/11/51	.....	6½¢
Monongahela Power	UWU	.....	.....	8¢
Montana-Dakota Utilities	IBEW	1/ 1 51	500	17¢
	IBEW	.....	.....	7%
Niagara Mohawk Power	IBEW	6/ 3/51	7,500	3%
New Bedford Gas & Edison	IND	1/ 1/51	400	9-17¢
New York State E & G	IBEW	1/51	2,800	6%
Northern Indiana PS	UMW (50)	6/ 1/51 9/23/51	1,600	4¢ ls 3¢ ad hol (7); 3 wk vc/ 15 yr (20) 3¢ (WSB)
Northern Pennsylvania Pwr	IBEW	.....	.....	3% and 3%
Omaha Public Power District	IBEW	9/ 1/51	825	7.1%
Ohio Edison	UWU	7/ 1/51	2,000	12¢ (WSB)
	IBEW	7/ 2/51	500	4-7¢
Ohio Power	UWU	7/ 1/51	1,100	22¢ pkg—plants†
		8/ 1/51	.....	20¢ pkg—opera.†
Pacific Gas & Electric	IBEW	1/ 1/51	22,000	9¢ (1%)
		4/ 1/51	12,500	5.8%
Pacific Power & Light	IBEW	12/50	.....	5%
Pennsylvania Electric	IBEW	1/20/51	2,300	6%
	UWU	1/20/51	500	6%
Pennsylvania Power & Light	IND	2/ 7/51	5,000	3½%; $125 pn incl soc sec
		11/19/51	.....	2%
Pennsylvania Power	IBEW	9/ 1/51	400	12¢
Philadelphia Electric	.....	9/25/51	6,125	3% (av 5-6¢)
Portland General Electric	IBEW	.....	.....	5%
Potomac Edison	IBEW	5/ 1 51	.....	av 7.7¢
Public Service of Indiana	IBEW	1/ 1/51	.....	2½%
		5/ 1/51	1,450	5%; 1-7¢ ca
Public Service of New Mexico	IBEW	.....	.....	7.4%
Public Service E & G	IBEW	5/ 1/51	4,300	2%
	OEIU	5/51	.....	2%
Pudget Sound Power & Light	IBEW	12/ 1/50	.....	9¢
		7/ 1/51	.....	2¢
San Diego Gas & Electric	IBEW	1/ 1/51	1,200	1.75%
		3/21/51	.....	4.25%
Savannah Electric & Power	IBEW	1/22/51	.....	2%
Scranton Electric	IBEW	6/ 1/51	550	6% (av 9¢), ad hol (9)
		12/20/51	.....	3% (WSB); ad 1 hr callout (4); 2½ pay on hol (2)
Sierra Pacific Power	IBEW	6/ 1/51	.....	6.4%
Southern Calif. Edison	IBEW	1/ 1/51	3,500	16¢ or 10%‡
	UWU	1/ 1 51	400	16¢ or 10%‡
South Carolina E & G	IBEW	.....	.....	6½%
Southern Colorado Power	IBEW	4/16/51	.....	4½%
Southwestern Public Service	IBEW	3/ 1/51	.....	5-12¢
TVA	IBEW	.....	.....	6-11%
Toledo Edison	IBEW	6/ 1/51	1,000	7½; ad 1½¢ hw
	OEIU	6/ 1/51	325	7¢
	IBEW	12/10/51	1,016	6¢ (3½%)
Tucson Gas, E L & P	IBEW	3/ 1/51	300	av 7% cl (WSB)
Union Electric Co of Mo	IBEW	7/ 1/51	2,700	9%††
	IUOE	7/ 1/51	1,250	5¢††
Utah Power & Light	IBEW	1/26/51	1,400	7½%
Virginia Electric & Power	IBEW	1/51	2,600	6%
Washington Water Power	IBEW	.....	.....	5%
Western Colorado Power	IBEW	1/26/51	.....	5-25¢ (WSB)
West Penn Power	UWU	.....	.....	6-13¢

Sources: Bureau of Labor Statistics, International Brotherhood of Electrical Workers (AFL), and Utility Workers Union of America (CIO).
Notes: Numbers in parenthesis after holiday indicates total, after call out pay indicates number of hours, after vacation indicates former service required. Pay on holiday means former rate of pay.
†Additional 3% (av. 4½¢) retroactive 10/21/50 to 6/30/51 and additional 3% some period (WSB). 3 wks vacation after 15 years (was 20). Cost of living. ††Additional 4½% of increase to physical workers retroactive to 7/1/51, plus another 4½% if WSB allows; 3½% for office workers retroactive to 7/1/51 and 5¾% more if WSB allows.
Abbreviations: b-in lieu of Christmas bonus; co-classification adjustment; cl-cost of living; g-whichever is greater; ia-inequity adjustment; hs-hospitalization; hw-health and welfare; m-increase in minimum rates; pn-pension; t-if WSB exempts utilities from 10% limit; vc-vacation; (WSB)-subject to WSB approval.





Trends in Electrical Manufacturing

NEMA report completely revised to present a new, more complete and comprehensive picture. Improved data make up each product series—more product series make up each index.

Total Shipments of Electrical Products 1925—1951

YEAR	1 Electrical Products	2 F. R. B. Production	3 Sales of Electricity	4 Appliances	5 Illuminating Equipment	6 Industrial Apparatus	7 Building Equip. & Supplies	8 Insulating Materials	9 Insulated Wire and Cable	10 Generation, Trans. and Distri. Equip.
1925	17.7	49	21	10.8	24.6	18.8	35.7	27.1	34.6	25.2
1927	20.6	51	26	13.6	32.2	19.8	35.5	26.8	39.3	27.1
1929	29.8	59	32	23.1	34.4	27.4	42.4	38.4	58.0	31.3
1931	18.3	41	31	14.9	19.0	13.7	22.4	19.7	20.7	17.1
1933	11.0	37	28	9.9	7.7	8.9	14.2	14.8	11.6	6.0
1934	13.8	41	30	13.0	10.2	12.0	17.0	17.5	17.1	8.9
1935	17.2	47	33	16.1	14.4	15.5	21.2	23.8	20.2	12.7
1936	22.7	56	38	21.7	20.3	23.6	28.5	30.1	29.8	19.0
1937	28.0	61	42	23.7	23.8	29.8	33.1	32.5	37.4	29.2
1938	20.8	48	40	16.7	24.4	19.8	24.2	18.7	25.1	21.8
1939	25.3	59	45	21.4	31.6	24.8	31.5	27.5	31.0	23.2
1940	32.8	68	50	24.2	45.0	34.3	36.1	36.7	41.0	31.2
1941	46.4	88	59	32.9	65.1	62.2	58.3	66.9	73.6	46.6
1942	43.3	108	68	10.2	55.1	94.0	59.2	90.8	83.7	57.8
1943	43.0	129	79	1.8	25.6	128.9	54.9	119.2	77.0	51.9
1944	43.0	127	84	1.1	26.1	122.6	56.3	107.3	79.4	47.2
1945	38.0	110	82	4.1	40.6	85.8	53.5	86.1	57.2	40.7
1946	58.8	92	81	44.6	83.6	68.5	64.6	75.2	77.6	40.1
1947	99.1	101	92	91.4	100.1	109.1	105.8	104.5	110.4	83.4
1948	102.4	104	102	108.4	103.0	105.7	111.4	105.5	107.6	113.0
1949	98.4	95	108	100.2	96.9	85.1	82.1	90.0	81.9	103.6
1950	136.1	108	119	161.5	117.7	114.1	115.4	128.6	128.6	102.5
1951	149.5	119	136	137.9	142.5	176.6	155.2	175.9	170.1	133.3

1. Electrical Products index based on total shipments of electrical products which are considered to cover not only those products included in the Electrical Machinery Group as defined by the U. S. Census of Manufacturers, but also lighting equipment, steam engines and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners, and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fiber, varnished fabric and paper etc.

2. F. R. B. Production index based on the Federal Reserve Board's revised index for total industrial production, unadjusted, and adjusted to 1947-1949=100.

3. Sales of Electricity index based on Edison Electric Institute's data on total kilowatt hour sales.

4. Appliance index based on shipments of household refrigerators, farm and home freezers, fans, household ranges, household dishwashers and food waste disposal units, water heaters, vacuum cleaners, household washing and ironing machines, dryers, electric housewares, commercial cooking equipment and radio and television receiving sets.

5. Illuminating Equipment index based on shipment of industrial, commercial and residential lighting fixtures, floodlights, street lighting equipment and aviation ground lighting equipment.

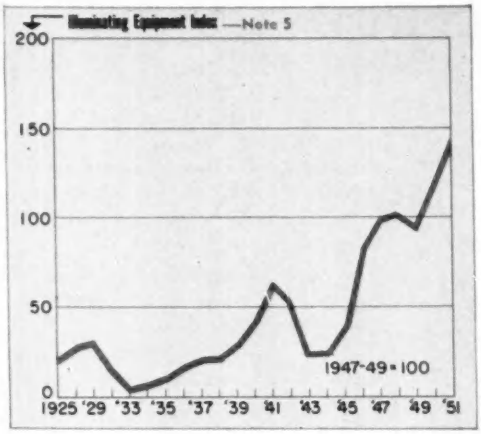
6. Industrial Apparatus index based on shipments of electric welding equipment and wire, industrial controls, industrial heating units and devices, motors and generators (except large apparatus), metallic rectifiers, induction and dielectric heating apparatus, electronic tubes (except radio), carbon products, mining belt conveyors, mining and industrial locomotives and resistance welders.

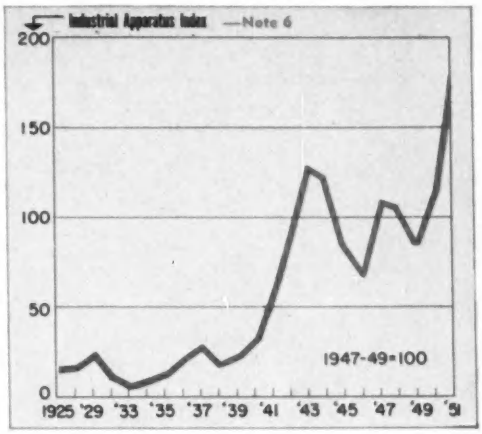
7. Building Equipment & Supplies index based on shipments of wiring devices, molded case circuit breakers, conduit fittings, metallic and plastic outlet and switchboxes, fuses, panelboards and distribution boards, knife and enclosed switches and busways.

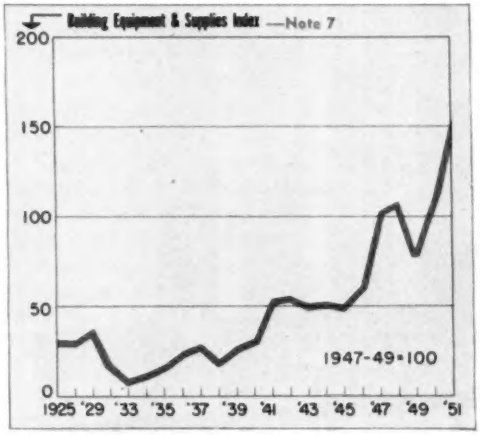
8. Electrical Insulating Materials index based on shipments of dry process and standard electrical porcelain, electrical insulating varnish, manufactured electrical mica, varnished fabric and paper, varnished tubes and saturated sleeving, vulcanized fibre and laminated products.

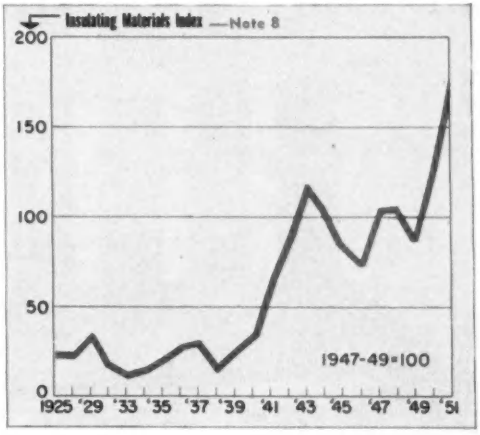
9. Insulated Wire and Cable for Light and Power index based on shipments of armored cable, magnet wire, rubber power cable, asbestos and paper insulated wire and cable, varnished cambric cable, rubber sheathed cord and cable, building wire and cable, flexible cords and cord sets.

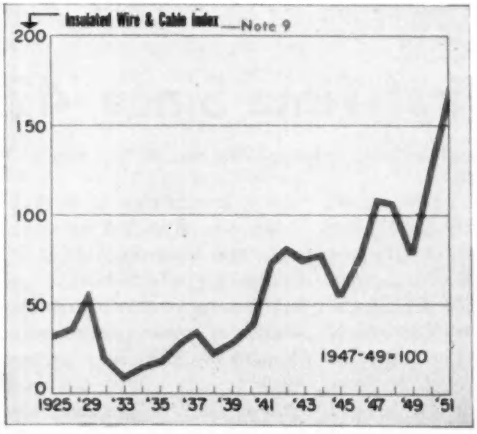
10. Generation, Transmission and Distribution Equipment index based on shipments of power capacitors, electrical measuring equipment, hydraulic and steam turbines, high voltage insulators, large generating and converting apparatus, switchgear, power and distribution transformers, lightning protective devices, feeder voltage regulators and overhead trolley line materials.

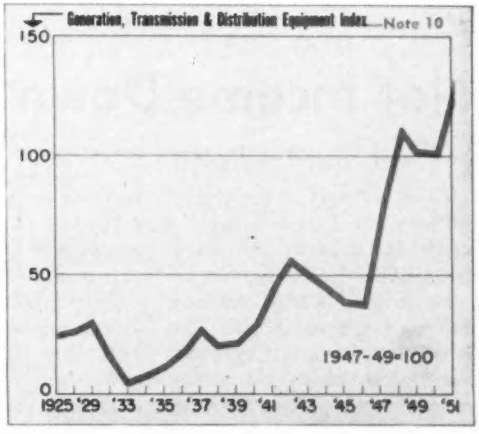

Illuminating Equipment Index —Note 5
200
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51

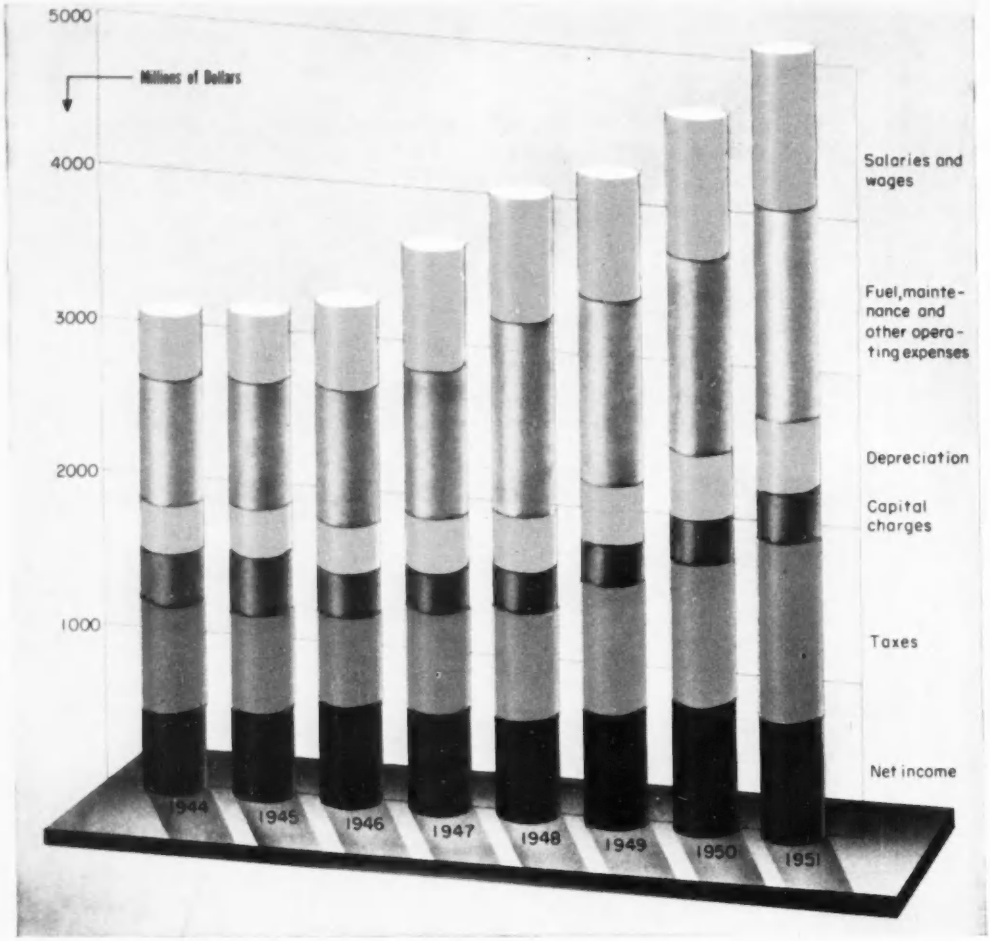

Industrial Apparatus Index —Note 6
200
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51


Building Equipment & Supplies Index —Note 7
200
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51


Insulating Materials Index —Note 8
200
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51


Insulated Wire & Cable Index —Note 9
200
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51


Generation, Transmission & Distribution Equipment Index —Note 10
150
100
50
0
1947-49=100
1925 '29 '33 '35 '37 '39 '41 '43 '45 '47 '49 '51



TAXES continue to be the largest single expense followed by salaries and wages which crossed the $1 billion mark in 1951 for the first time

Net Income Down First Time Since '42

Higher interest costs; taxes, particularly federal; salaries, principal factors in this trend

Gross revenues of the electric industry hit a record high of nearly $5 billion in 1951, about 10% above 1950. But net income dropped to $814 million, a decrease of 2% under 1950. This is the first time since 1942 that net income has been less than the year before. Total financing in 1951 approximated $1,442 million of which $1,432 million was for new capital to take care of part of the present expansion.

Gross revenues hit a record at $4,955 million an increase of 9.9% over 1950. The largest increase in revenues came from residential sales which jumped 12.6% over 1950. All major classes shared in the upturn as kwhr sales totaled a high of 317 billion, 13% above 1950.

Operating expenses went up nearly as much as revenues, showing a 9.7% increase over 1950.

Fuel—Of all operating ex-

penses, fuel showed the largest increase in 1951 over 1950, going up 13%. In 1951 fuel generation totaled 16.5% above 1950 whereas hydro generation showed an increase of only 3½%. This necessitated use of much more fuel.

Wages and salaries—This expense, being the second largest in the statement of income and exceeding $1 billion for the first time, has continued its upward trend, increasing 9.6%, slightly less than the gross revenue increase of 9.9%.

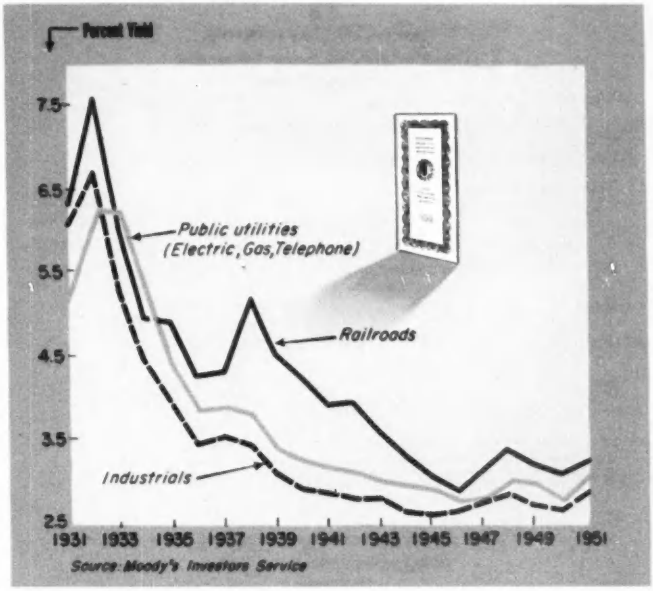
Other operating expenses—This showed only a 4.5% increase over 1950.

Depreciation—This account continued its uptrend with an increase of 9.6% paralleling the $1.8 billion of new property added during the year.

Taxes—This expense was again the largest of the industry's income. It rose 19.4% in 1951 above 1950 with Federal taxes leading the way with an increase of 25.1% as the new 52% rate on income became retroactive to April 1. The bright side, however, was the recent elimination of the 3 1/3% excise tax.

Gross income hit a record high in 1951, totaling $1,121 million, up 0.7% over 1950. Electric operating income totaled $976 million, up $11 million or 1%. Income from other departments showed an increase of 8.2% but this was offset by an 8.1% slippage in other income because of decreased interest on investments and inter company dividends.

Income deductions kept moving upwards. The industry issued $889 million in bonds and debentures, causing the interest expense to increase. The cost of long-term money showed a decided upswing in 1951 as indi-



AVERAGE YIELD of public utility bonds rose at a much sharper rate in 1951 than that of either railroad or industrial bonds. The 3.09% yield reported for public utilities is just about half of the 6.25% yield shown in 1933, but other bonds declined even more.

Composite Year End Balance Sheet
Electric Utility Companies (Class A and B)

	Millions of Dollars		
	1950	1949	1948
ASSETS:			
Electric Plant and Adjustments	18,956	17,326	15,513
Other Utility Plant and Adjustments	2,485	2,302	2,244
Total Utility Plant	21,441	19,628	17,757
Reserves for Depreciation and Amortization of Utility Plant	4,385	4,069	3,859
Total Utility Plant Less Reserves	17,056	15,559	13,898
Investment and Fund Accounts	1,235	1,272	1,155
Current and Accrued Assets	2,058	1,899	1,985
Deferred Debits	172	176	227
Capital Stock Discount and Expenses	41	39	35
Reacquired Securities	26	57	46
Total Assets	20,590	19,001	17,346
LIABILITIES:			
Capital Stock	7,944	7,256	6,590
Long Term Debt	9,189	8,572	7,719
Current and Accrued Liabilities	1,527	1,359	1,360
Reserves (except those deducted above)	86	99	100
Deferred Credits	109	103	112
Contributions in Aid of Construction	66	60	54
Surplus	1,670	1,552	1,411
Total Liabilities	20,590	19,001	17,346

Source: Federal Power Commission.
* Data revised to include Gas Plant classification which was discontinued in 1948. All plant is now classified as "electric" or "other."

Composite Income Statement
Electric Light and Power Companies
(Millions of Dollars)

	1946	1947	1948	1949	1950	1951
Total Electric Revenue	3,127	3,480	3,886	4,113	4,510	4,955
Operating Expenses	1,385	1,701	2,019	2,030	2,158	2,367
Depreciation	324	339	366	389	438	480
Total Expenses	1,709	2,040	2,392	2,419	2,596	2,847
Electric Operating Income before Taxes	1,418	1,440	1,511	1,694	1,914	2,108
Taxes	639	664	716	794	948	1,132
Electric Operating Income after Taxes	779	776	795	900	966	976
Other Income (1)	130	125	119	132	147	145
Gross Corporate Income	909	901	914	1,032	1,113	1,121
Capital Charges (2)	259	245	244	267	282	307
Net Income	651	656	666	765	831	814
Dividends	466	500	499	655	626	670
Surplus	185	156	167	110	205	144

Source: Federal Power Commission and Edison Electric Institute. * Estimated.
(1) Includes revenues of gas, water and steam departments and interest on securities held.
(2) Includes amortization and interest on long-term debt.

Distribution of Revenue Dollar
(Percentage)

	1946	1947	1948	1949	1950	1951*
Fuel	13.1	16.4	19.3	16.6	16.6	16.9
Salaries and Wages	18.5	20.6	20.4	20.3	19.9	19.9
Other Operating Expenses	10.9	10.2	10.6	10.9	9.8	9.7
Depreciation	9.9	9.4	9.1	9.2	9.5	9.4
Fixed Charges	8.0	6.8	6.1	6.3	6.1	6.0
Taxes	19.6	18.4	17.8	18.7	20.3	22.2
Dividends and Surplus	20.0	18.2	16.7	18.0	17.8	15.9
	100.0	100.0	100.0	100.0	100.0	100.0

Source: Federal Power Commission and Edison Electric Institute.
* Estimated.

Security Sales by Electric Light and Power Companies
(Thousands of Dollars)

Year	Bonds, Debentures, etc. to		Stocks, Common and pfd.	Total Financing	Distribution of Security Sales		
	Public Investors	Institutional Investors			New Capital	Refunding	Total Issues
1937	522,613	37,604	86,095	646,312	81,984	563,699	645,682
1938	750,549	192,762	20,694	964,005	123,056	840,949	964,005
1939	620,205	252,625	123,517	996,347	16,219	980,128	996,347
1940	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941	368,712	255,912	116,208	740,832	97,065	643,767	740,832
1942	226,800	99,688	29,766	356,254	92,666	263,588	356,254
1943	329,300	26,850	14,912	371,062	9,921	361,141	371,062
1944	851,743	103,950	62,535	1,018,228	15,587	1,002,641	1,018,228
1945	1,113,603	121,051	127,268	1,361,922	39,699	1,322,253	1,361,922
1946	633,966	64,040	384,441	1,082,447	172,846	909,601	1,082,447
1947	1,039,517	153,159	384,699	1,577,375	567,729	1,009,646	1,577,375
1948	996,641	156,525	297,460	1,450,626	1,314,456	136,170	1,450,626
1949	959,978	192,280	640,953	1,793,211	1,444,826	348,385	1,793,211
1950	838,108	278,389	591,340	1,707,837	1,300,040	407,797	1,707,837
1951	778,308	110,696	552,943	1,441,947	1,432,257	9,690	1,441,947

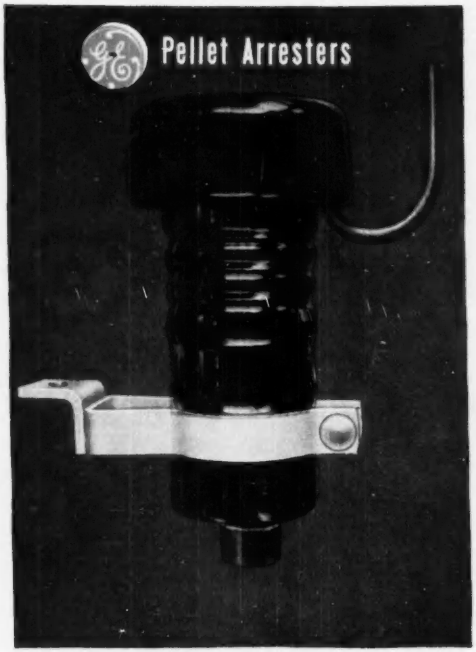
cated by a rise in the Moody's average bond yield for public utilities from 2.82% in 1950 to 3.09% in 1951.

Net income turned downwards for the first time since 1942 to $814 million in 1951, off 2% from 1950.

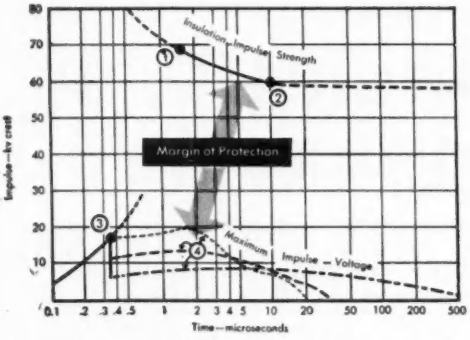
Dividends were not affected during 1951 even though net income was off 2%. The industry paid out 4.4% more in preferred dividends in 1951 than in 1950. The reason was that the industry issued $190.7 million of new preferred, mostly at higher rates than heretofore because of rising money costs in the security market. Common dividends showed an even larger increase, jumping 7.6% as the companies floated over $362.3 million in common stock and a number of companies whose earnings were better in 1951 than 1950 raised their dividend rate or paid extras.

Balance to surplus fell off in 1951. With a declining net income and a steadily increasing of common and preferred stock, utility companies were able to carry to surplus only $144 million in 1951, the lowest figure of post-war years, nearly 30% below 1950.

Financing totaled $1,441 million in 1951, 15.5% below 1950. The outstanding event in 1951 was the sharp increase in the higher cost of bond money as a result of the fundamental change in the government monetary policy. This also affected preferred stock issues, making it difficult to sell them. Of the total $1,441 million of financing in 1951, $1,432 million was new capital as compared with $1,300 million in 1950, and only $9.7 million was for refunding purposes as against $407.8 million in 1950.



THE G-E PELLET ARRESTER is also unequalled in durability—the only distribution arrester with series gaps sealed in dry, inert nitrogen. Gap electrodes stay bright as new. The Pellets, themselves, are unaffected by service moisture.



THIS GRAPH was made from actual volt-time and ampere-time oscillograms, and from AIEE standard test data. The demonstrated impulse strength of 2400-volt distribution transformer insulation is represented by the curve passing through: (1) the minimum impulse strength on an AIEE standard chopped wave test, and (2) the minimum impulse strength on an AIEE standard full wave test. The impulse voltage allowed by a 3-kv General Electric Pellet Arrester is determined by (3) the impulse sparkover voltage of the arrester on the AIEE standard test wave, and (4) the IR drop across the arrester to ground with (top line) a 65,000 ampere discharge—(middle line) a 20,000 ampere discharge—and (bottom line) a 1500 ampere long duration discharge. The arrows show the unequalled margin of safety.

No other distribution arrester protects so well

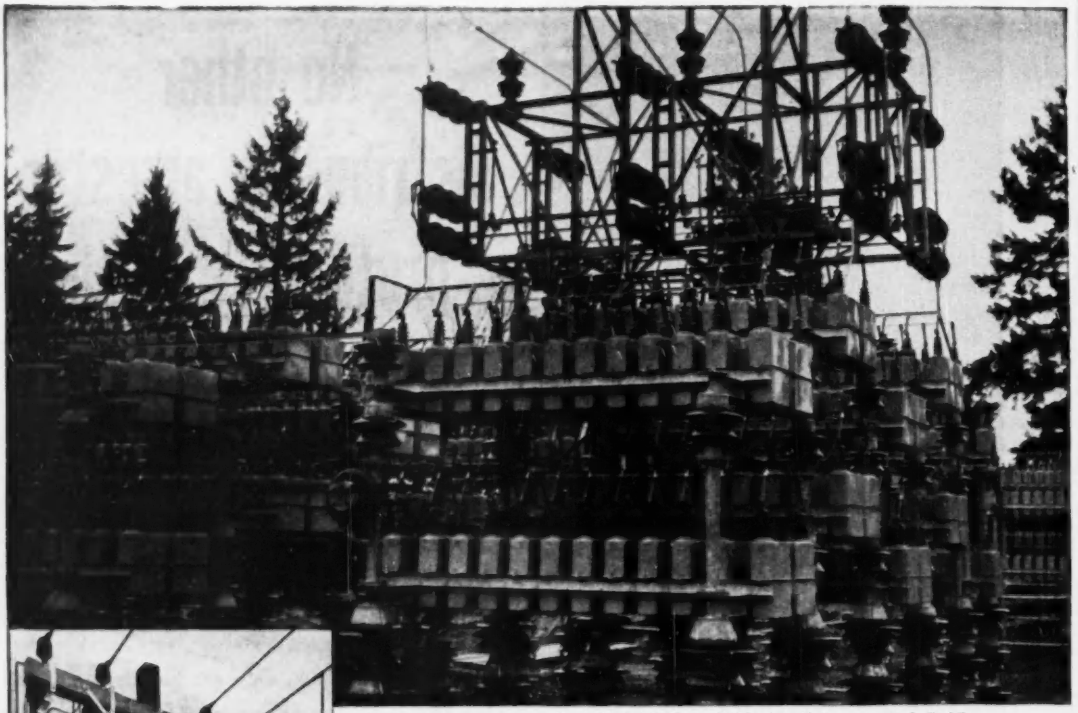
HERE'S THE EVIDENCE. The graph below, from actual volt-time and ampere-time oscillograms, shows the unequalled margin of safety that a 3-kv General Electric Pellet Arrester gives a 2400-volt distribution transformer. Higher rated arresters, protecting higher-voltage transformers, similarly show this unequalled margin of protection.

HERE'S THE REASON. This extra protection results from a combination of low sparkover voltage *and* exceptionally low IR drop. Whether lightning currents are high or low, with durations long or short, *no other distribution arrester holds voltages to such low levels.*

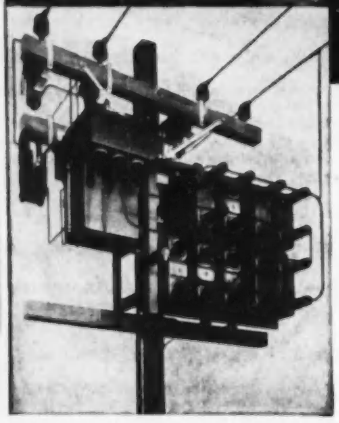
HERE'S YOUR CUE. The Pellet is a valve-type arrester for universal use on urban, rural, or industrial systems. It is available in ratings of 1 kv to 15 kv inclusive. This arrester has been *the* quality-standard for over 25 years—it's your cue for maximum protection. For further information contact your G-E representative or your authorized G-E agent.

Apparatus Department,
General Electric Company,
Schenectady 5, N. Y.

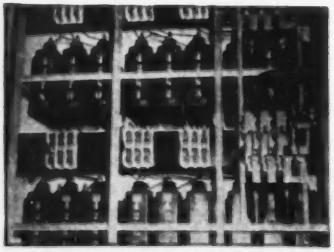
GENERAL ELECTRIC



High-voltage capacitors such as this 32,400-kvar, 124-kv installation, supply bulk kilovars—re-enforce subtransmission and transmission voltages—reduce thermal loading on substations and generators.



Switched-capacitors such as this 225-kvar unit supplement fixed capacitors in raising voltage levels and reducing substation loading at peak conditions.



Secondary-capacitors on networks and residential secondaries help offset rising loads. They keep power factor up—permit heavier loading within permissible voltage limits.

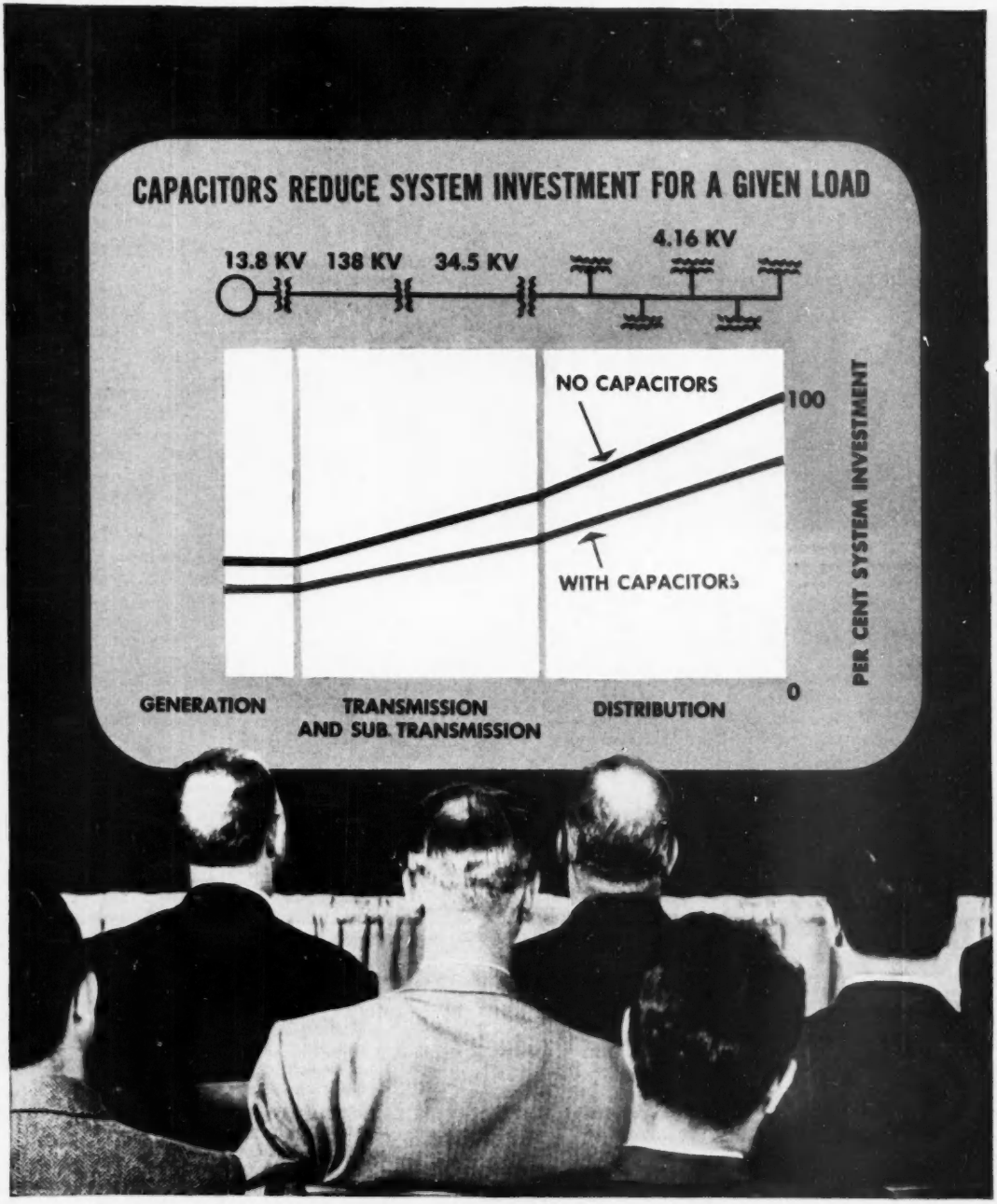
System-wide use of G-E Capacitors holds key to new savings

Many types available to provide quick release of kw capacity—reduce system investment

As systems operate closer and closer to capacity, electric utilities in all parts of the country will find it profitable to take another look at capacitors—and capacitor economics.

Capacitors have long provided one of the fastest, cheapest ways to release system capacity. But today, as opposed to a few years ago, they can be used in more places—and in larger quantities. High-voltage banks, switched pole-type equipments, 230-volt units for secondaries all offer opportunities—which were not available even five years ago—for increasing system capacity while lowering investment per kw. By reducing system current for a given load, they usually free distribution, substation, transmission and generating facilities for the delivery of additional kilowatt load—at a fraction of the cost—and in a fraction of the time it would take to add new capacity.

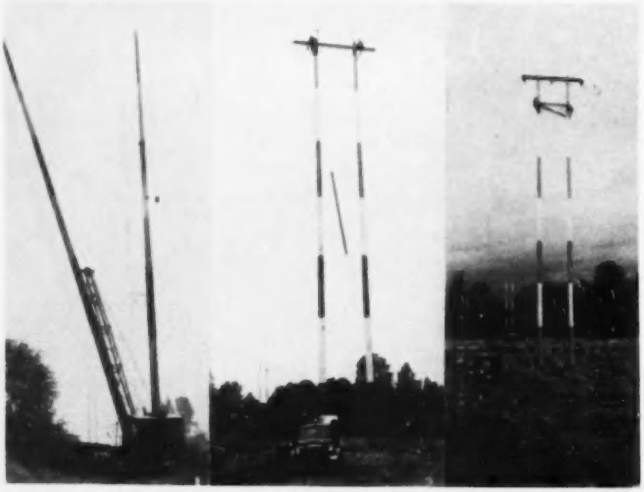
Even if you have installed a high ratio of capacitor kvar to system kw peak load, it will pay you to re-evaluate today. A General Electric specialist will be glad to work with you in determining what proportion of your increased load can be economically supplied by capacitors. Call your nearest G-E Sales Office or write *General Electric Company, Schenectady 5, N.Y.*



Above slide shows the reduction in system investment that capacitors made on an actual system. It's taken from General Electric's Utility capacitor slidefilm which has already been shown to more than 100 major utilities.

407-35

GENERAL ELECTRIC



CEDAR POLES 125-FT HIGH were used for this H-type transmission tower in Puget Sound P & L's new line. Three stages of construction are shown: setting the poles, raising a crossarm with truck mounted winch, and bolting crossarm in place

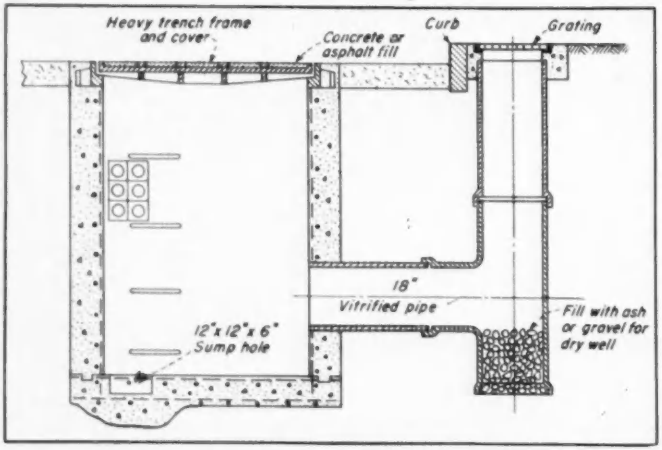
Cedar Poles Cut Initial Cost of Crossing

Cedar poles up to 125 ft high saved Puget Sound Power and Light Co an estimated 25% on construction of crossings on two navigable waterways traversed by a 13-mile, 55-kv transmission line in northwest Washington. Part of the saving was in material cost, part on erection. The six poles used, ranging in height from 113 ft to 125 ft, were cut on Vancouver Island and transported by flat car and ferry to Vancouver and then to Bellingham, where they were butt treated for rot resistance. After treatment they were carried to location sites by truck-trailer.

To erect the poles a tractor type crane with 60-ft boom arm was employed. To minimize settling in the fine silt of the river banks, the poles were set 11½ ft apart to a depth of 12 ft and each pair crib-braced. A gas shovel was used to dig a trench for both poles and anchors, after which the poles were raised with their butts in the trench. After crib bracing and partial guying were installed, the entire trench was back-filled by a bulldozer. Each two-pole H-frame tower required one day for erection.

Galvanized steel strand guys ½ in. in diameter were attached at top and mid-position of each tower in four directions. They were tied to the "deadman" anchors of 6 and 9-ft cedar logs backed by channel iron. Anticipated flooding of the waterways up to the 9½-ft level on the poles was prepared for by dead-ending the conductors in the adjacent spans directly on Class 1 poles.

Keep Transformer Manholes Clean and Ventilated



TRANSFORMER MANHOLES can be kept clean and ventilated by a sealed cover and a vent pipe and dry well. Cracks between trench frame and cover are filled with duct-seal composition to keep out surface water and other foreign matter

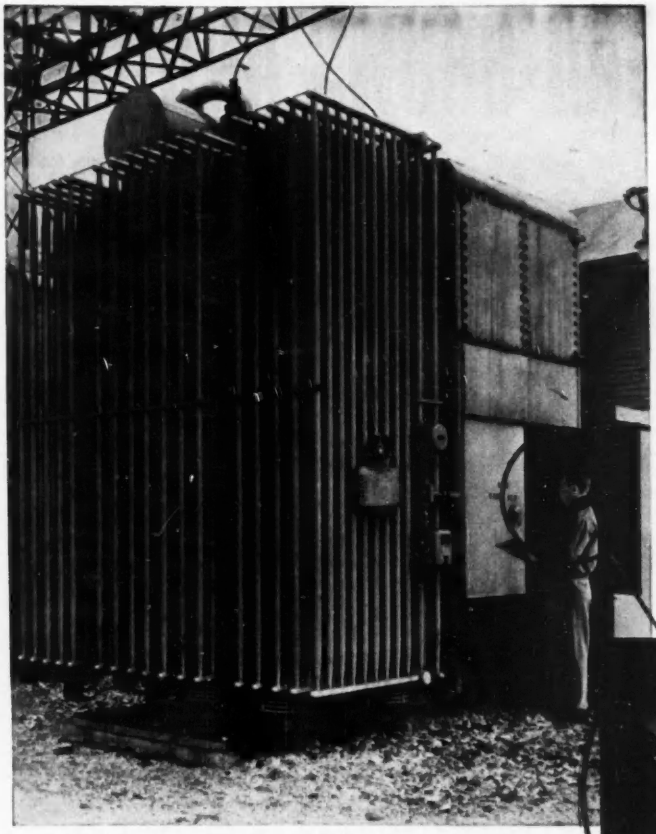
G. H. PEARSALL
Distribution Engineer
Staten Island Edison Corp
Staten Island, N. Y.

Sealed tops and side ventilation for transformer manholes keep out surface water, salt solutions (calcium chloride) during the winter, and debris and other foreign objects. This method is used on underground distribution transformer installations on Staten Island because of the lack of storm sewers.

Body of the manhole is constructed in the field of 9-in. concrete reinforced with ⅝-in. rods both horizontally and vertically. Overall, the vault has a length of 12 ft, 7 in.; width of 6 ft, 6 in.; and height of 8 ft, 9 in.

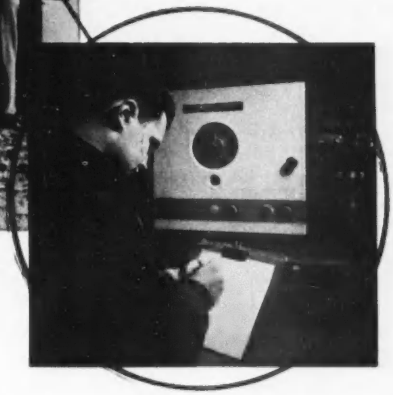
Ventilation is provided through openings at the side of the manhole.

(*Continued on page* 164)



General Electric transformer rated 6000/7500 kva, 33-kv, installed on Indianapolis Power & Light System. Load-ratio control in low-voltage winding provides ±5% voltage regulation.

Prediction: 14 years of tap changes without any servicing



This particular G-E transformer will operate 14 years at its current rate of 20 tap changes a day before its load-ratio-control equipment requires servicing. This means that for 14 years the maintenance crew will not have to clean insulating surfaces or filter the contactor oil! In fact, the contactor compartment need not be opened during this entire period.

The really significant point, however, is this: We can tell you—and do tell you for each transformer—how many operations the LRC equipment will make before any servicing is required. We have tested the contacts of each design until we know, accurately, the life of the arcing tips. By the use of electrostatic shielding, and by having a major portion of creepage distances in the vertical plane, we prevent dangerous deposits of carbon from forming on insulating surfaces during this period.

In other words, with G-E load-ratio-control equipment, you don't do any *unnecessary* service work. You simply refer to the instruction book and read the counter to predict the time that servicing is actually required.

Over 37,000,000 installed kva have proved that General Electric LRC is as reliable as the core and coils themselves. Call on your G-E representative for a complete discussion on the LRC transformer best suited to your application. *General Electric Co., Schenectady 5, N. Y.*

401-18

GENERAL ELECTRIC

THE LOAD GROWS AND San Francisco's Network PAYS OFF

Installation of this newest General Electric Network unit shows again how easily you can add new distribution capacity if you have a network

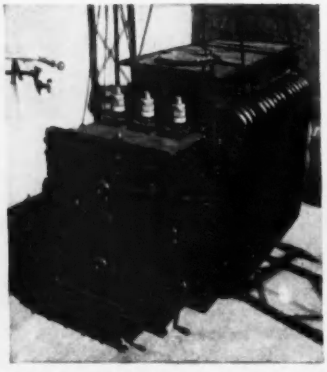
For more than 20 years downtown San Francisco has enjoyed the advantages of its secondary network—virtually uninterrupted service and uniformly good voltage. And Pacific Gas and Electric has profited from the complete flexibility for meeting load growth—on an orderly, step-by-step basis—without any rearrangement of secondaries or service entrances.

The installation of this 500-kva G-E network unit demonstrates a network's flexibility and economy for meeting load growth problems. When additional capacity was needed to meet the rising load in downtown San Francisco, P G & E simply constructed a transformer vault midway between two existing units and extended a primary feeder two blocks. Since the secondary cable passed by the vault site, connections were easily made and the new transformer was ready to pick up its share of the network load. That's all there was to it. Little or no additional secondary copper was needed! And rearrangements were unnecessary because the low-voltage grid, *not* the individual transformer, feeds the load.

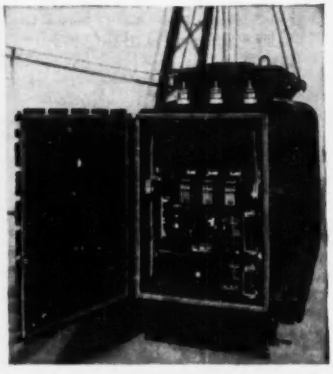
When you investigate the flexibility and economy of networks, be sure to consider the extra advantages of G-E standardized network equipment. Repetitive manufacture of standardized units means faster delivery at lower price. Refinement of design—made possible by quantity production—lowers installation and maintenance costs.

With application experience dating back to the inception of networks, General Electric can help you with all your network problems. For further information, see your G-E representative, or write for Bulletins GEA-5024 and GEA-2017D, General Electric Company, Schenectady 5, New York.

Faster delivery—lower price: G-E Standardized Network Equipment eliminates special engineering and drafting—simplifies purchasing. Quantity production methods reduce manufacturing and assembly time. You get faster delivery at lower prices.



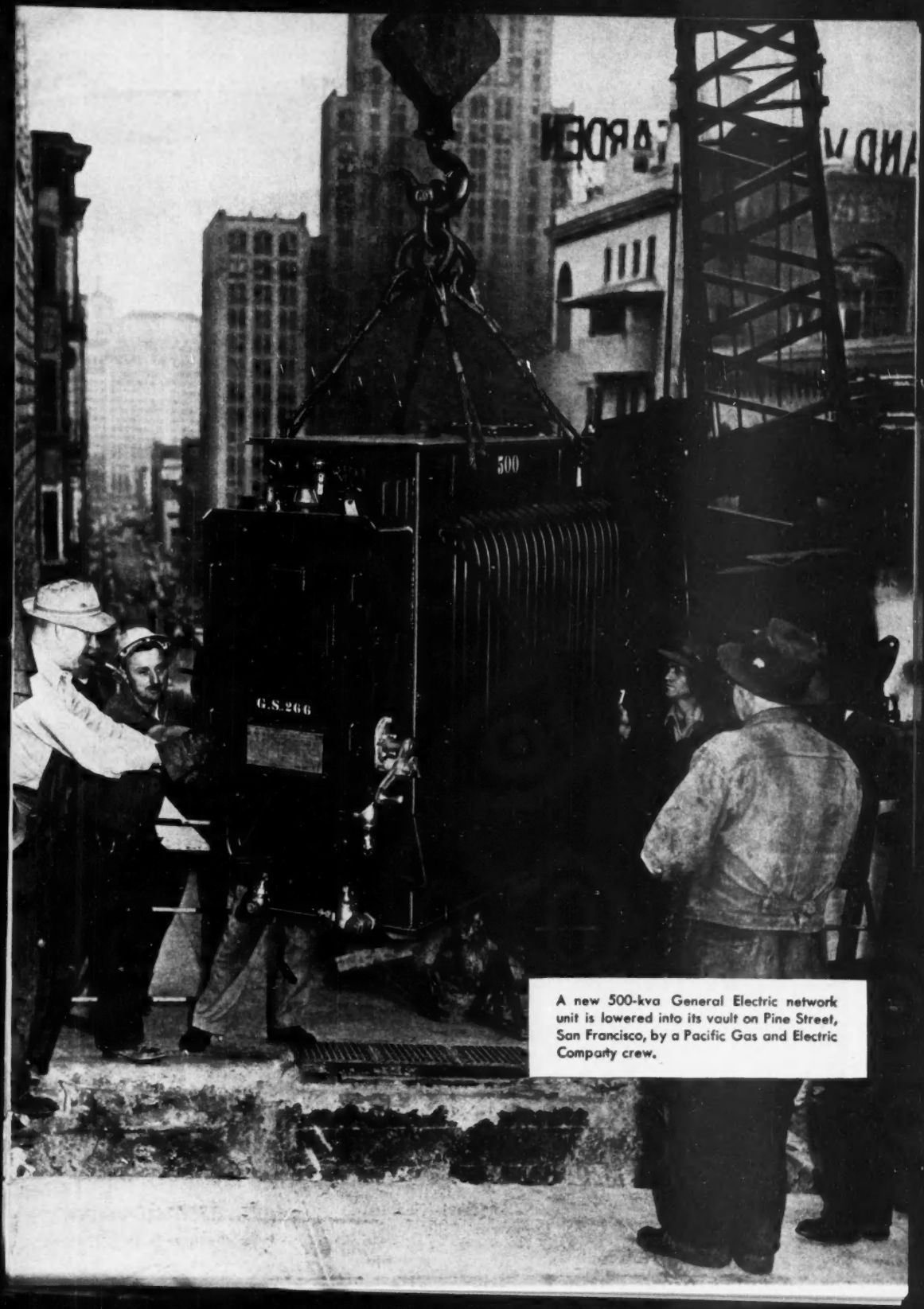
Minimum vault sizes: Both high- and low-voltage cable terminals are well below top of transformer, permitting vault depth of 7 ft. to roof slab. With servicing done from the two ends, vault can be of minimum size for lower installation costs.



Less maintenance: All accessories conveniently grouped at high voltage end of transformer—network protector can be rolled out for inspection—gages are at eye level for easy reading.

GENERAL ELECTRIC

402-114



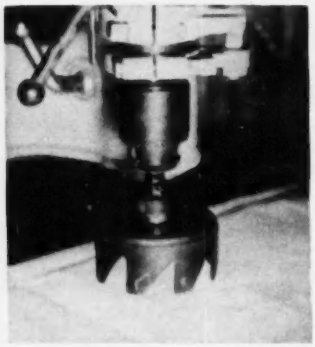
A new 500-kva General Electric network unit is lowered into its vault on Pine Street, San Francisco, by a Pacific Gas and Electric Company crew.

When the manhole is under the street, ventilation is provided through two vitrified pipes run into the sidewalk near the curb. If the manhole is under the sidewalk, ventilation is provided through a slot and a rectangular concrete well on the curb side. In either case, the vertical section of the ventilation has a bottom opening filled with gravel for a dry well. In both cases the vent top is flush with the sidewalk.

Manhole top has a major section made of a grey cast iron trench frame filled with concrete or macadam. It is rated for 20-ton loading. Another section (not shown) is a steel frame with a 30-in. diameter cover.

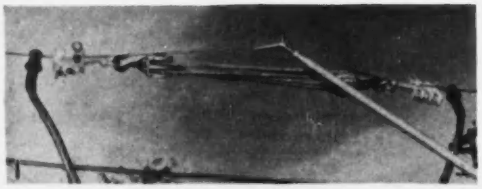
Modified Circular Saw Drills Holes in Panels

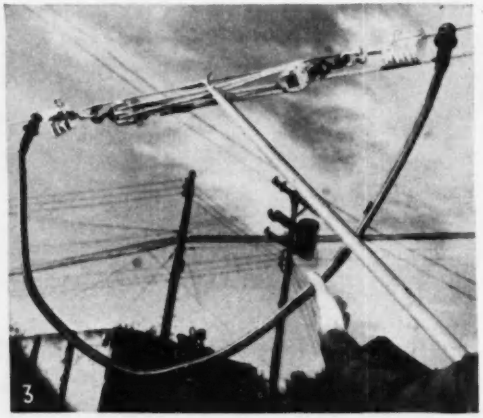
Circular hole saw modified by larger openings to eliminate clogging reduces to minutes the time necessary for drilling circular holes in ebony asbestos switchboard panels. This device will cut a ¾-in. deep hole very easily. A sharp blow on the back of the board will dislodge the cutout section. The process is repeated until the desired hole is made. This device was made by D. W. Chick, Texas Electric Service Co, Eastland, Tex., from a commercial circular hole saw. Previous method of drilling holes averaged two hours per hole.



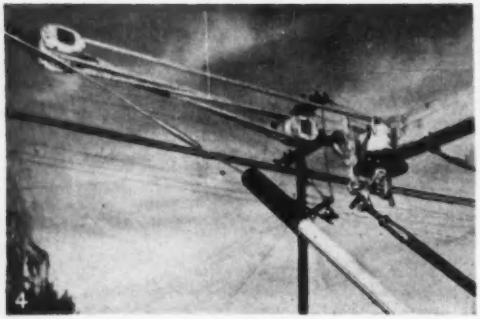
LARGER OPENINGS in circular saw eliminate clogging and cut drilling time

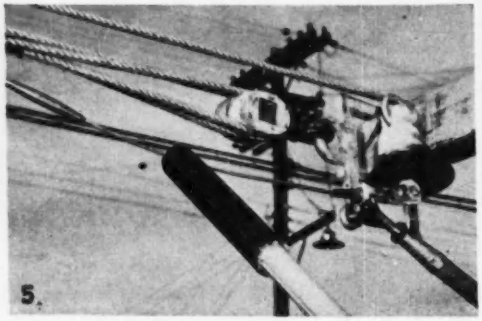
New Hot Line Tool Halves Splicing Time





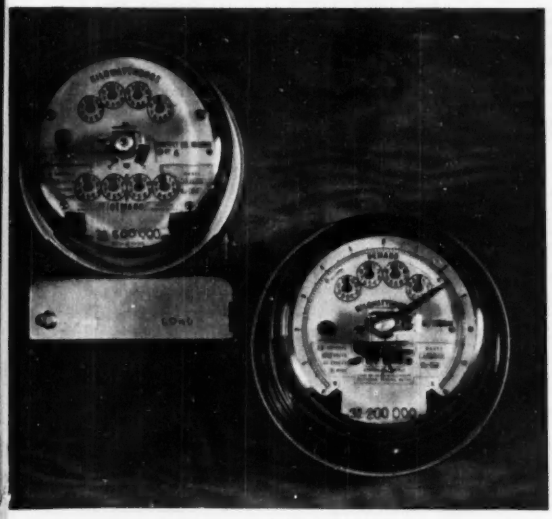
NEW SPLICING TOOL eliminates clamp stick in making hot line splices or deadend connections. This tool cuts splicing, deadending time by 50%. Tapered throat holds automatic splice (1) which is slipped over one conductor end. Horns on the tool align the other conductor end so it slips right into place (2); hot blocks pull the ends together to complete the operation (3). To remove the tool, the workman strikes the hot stick with the flat of his hand after the splicing operation is completed





DEADENDING IS SPEEDED by using the upright ears of the tool to control the deadend clevis (4) and to keep the splice in position (5). Tool was developed by Wm. Kibbie, Idaho Power Co line foreman; has been made in three sizes to handle No. 4/0 through 8 wire

Announcing IM-50 Watthour Demand Meters



NEW IM-50 METERS are available for socket or front connections. They can be used on circuits where voltage is either 10% above or below rated meter voltage. Registers are available separately.

New single-phase meters now available with indicating or cumulative registers

General Electric's I-50 meter line has been extended to include the IM-50 watthour demand meter. Primary applications are for small commercial and industrial loads.

WITH M-30 INDICATING REGISTERS, you are assured of positive reset by Geneva action . . . with no shock. These registers have a long, 9¼-inch scale. There are no springs, latches, or governors. Reset load on the motor is low . . . and motor life is long. This unit, with a minimum number of parts, provides maximum flexibility for all indicating demand measurements.

WITH M-31 CUMULATIVE REGISTERS, these meters provide an indication of maximum demand plus the cumulative value of previous maximum demands.

All construction features of I-50 watthour meters are also included . . . magnetic suspension, butyl and polyethylene insulation, and others.

For more information, contact your G-E representative or write Section 601-52, General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

601-52

How Meter Tilt Can Affect Accuracy

K. R. WEIGAND
Division Meter Superintendent
Indiana & Michigan Electric Co.
South Bend, Indiana

To determine the error that may result from failure to mount watthour meters properly, tilt tests were conducted in our meter department. Five currently-used types of single-phase watthour meters made by four different manufacturers were tested for registration. Tests were made with the meter axis tilted different degrees through on 8-deg arc forward, backward, and sideways from vertical. To facilitate the tests a special meter-mounting device was constructed so it could be clamped to the laboratory photoelectric testboard.

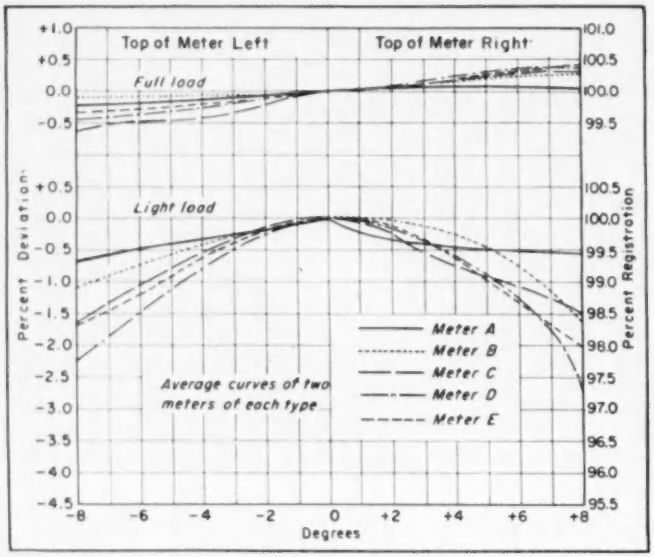
Two new meters of each type were selected at random and tested at 2-deg intervals. Several runs at each tilt were made and the registrations of the same type meters averaged for each tilt. Then the average curves for each type were arranged so all curves would cross at 100% registration when the meters were plumb.

The accompanying curves demonstrate that out-of-plumb meters may have registration errors several times permissible tolerances. Furthermore, despite the symmetry of the rotating element, the error at any angular tilt may differ depending on the type of meter and whether the top of the axis is tilted forward, backward, left or right. For example, examine the light-load registration curves for meters C and D with 4-deg tilts forward and backward; also observe the difference in full-load registrations of all meters when the tilt is shifted from forward to backward or from left to right.

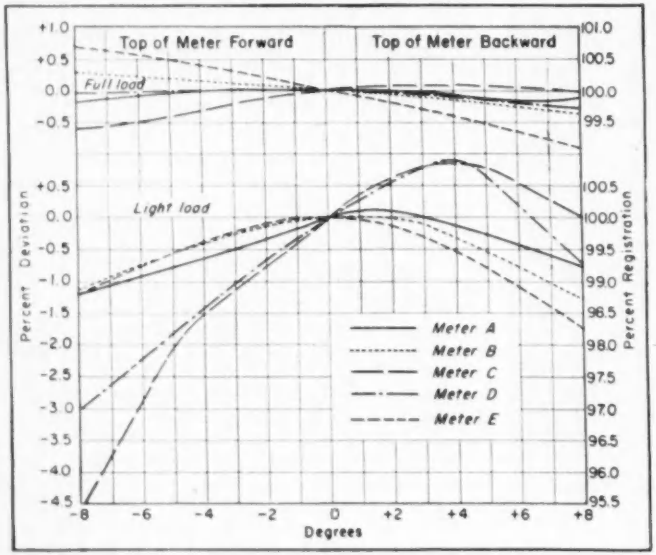
To visualize the tilts and effects in practical terms, consider two meter C examples shown in an accompanying listing.

These data emphasize the necessity of plumbing meters in two vertical planes at right angles to each other. This precaution must be taken not only when installing meters but immediately whenever the plumbness of any meter is questionable.

Unfortunately this requirement is frequently overlooked or mistakenly considered unimportant.



LEFT OR RIGHT TILT may produce variation in percent registration at light and full loads



FOREWARD OR BACKWARD TILT may vary percent registration at light and full loads

Tilt and Registration for Meter C

Tilt	Percent Registration Light Load	Full Load
2.4 deg forward[1]	99.1	99.85
4.8 deg backward[2]	100.8	100.1

[1] Corresponds to meter socket mounted with bottom touching vertical wall and top ¼ in. from wall.
[2] Corresponds to meter socket mounted flat against piece of installed 9x¾-in. siding.

The new pot lines at the Jones Mills plant of the Reynolds Metals Company add greatly to our country's supplies of aluminum. Note the tremendous copper bus bars required to feed electricity into the "pots" from which aluminum ingots are poured. Thus Revere participates in the government-inspired increase in aluminum production.

It takes a lot of REVERE COPPER BUS BAR to increase aluminum production

● The Government has directed Revere to produce millions of pounds of copper bus bar for the new aluminum plants being put into operation in order to increase the output of this light metal that is so essential to defense. Copper is the ideal metal to carry the heavy currents required for the "pots" that produce aluminum from the ore. Thus aluminum and copper are intimately linked together. Aluminum is used in planes, ships, weapons, missiles, ammunition, and in many other defense applications. Copper, best of all the commercial metals in electrical conductivity, likewise has many vital tasks to perform for our armed forces, afloat, ashore, and in the air.

Revere is glad that its large capacity for the production of bus bar is so valuable in these times; in our long history of over 150 years of service we have always given everything possible in times of our country's need. However, we are regretful that today's government requirements materially limit our ability to fill civilian orders. We look ahead, eagerly and hopefully, to the time when the present urgent demands are met to such an extent that orders for bus bar and other Revere products can be filled more promptly.

REVERE

COPPER AND BRASS INCORPORATED

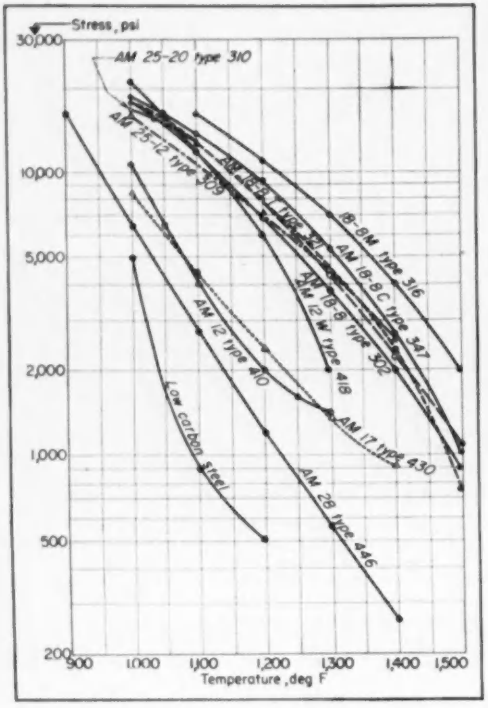
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



CREEP STRENGTH of stainless steel (AM) based on 1% creep in 10,000 hr, design item where close tolerances must be maintained

Stainless Steel: Heat Resistant Applications

Tabulation lists typical heat resistant applications with grades for the various uses and applicable temperature ranges. Chart presents the creep strength for the various grades at temperatures above 900F. Data are adapted from Stainless Steel Handbook by Allegheny Ludlum Steel Corp

Various Grades of Stainless Steels, Their Compositions and Typical Heat Resistant Applications

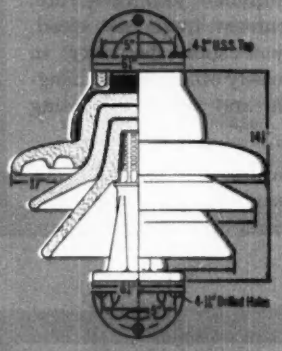
AISI Type No.	Group*	AM Grade Name	Chromium %	Nickel %	Carbon %	Manganese %	Silicon %	Other %	Maximum Service Temperature (F) in Air		Applications
									Continuous	Intermittent	
302	A	18-8	17.00-19.00	8.00-10.00	over 0.08-0.20	2.00 max.	1.00 max.	.....	1700	1600†	Furnace parts, heat treating fixtures, petroleum refinery equipment.
309	A	25-12	22.00-24.00	12.00-15.00	0.20 max.	2.00 max.	1.00 max.	.....	2000	1800†	Furnace parts, heat treating fixtures, annealing boxes & covers, boiler supports.
310	A	25-20	24.00-26.00	19.00-22.00	0.25 max.	2.00 max.	1.50 max.	.....	2100	1900†	Furnace parts, heat treating fixtures, jet engine sheet metal components, boiler supports.
316	A	18-8M	16.00-18.00	10.00-14.00	0.10 max.	2.00 max.	1.00 max.	Mo 2.00-3.00	1700	1600†	Furnace parts, heat treating fixtures.
321	A	18-8T	17.00-19.00	8.00-11.00	0.08 max.	2.00 max.	1.00 max.	Ti 5 × C min	1700	1600†	Aircraft exhaust manifolds, jet engine
347	A	18-8C	17.00-19.00	9.00-12.00	0.08 max.	2.00 max.	1.00 max.	Cb 10 × C min	1700	1600†	sheet metal work, duct work.
410	M	12	11.50-13.50	0.50 max.	0.15 max.	1.00 max.	1.00 max.	.....	1300	1500	Furnace parts, heat treating fixtures, turbine blading, petroleum refinery equipment.
418	M	12 W	12.00-14.00	0.50 max.	0.15 max.	1.00 max.	1.00 max.	W 2.50-3.50	1300	1300	Boiler supports, cracking still tubing, furnace parts, heat treating fixtures.
430	F	17	14.00-18.00	0.50 max.	0.12 max.	1.00 max.	1.00 max.	.....	1500	1600	Furnace parts, oil burner shells and other parts.
446	F	28	23.00-27.00	0.50 max.	0.35 max.	1.50 max.	1.00 max.	N₂ 25 max.	2000	2150	Furnace baffles and other parts, pyrometer protection tubes, soot blower tubing.

* A = Austenitic; hardenable only by cold working F = Ferritic; non-hardenable M = Martensitic; hardenable

† A lower temperature is recommended for intermittent service because of the difference in expansion characteristics between the scale which is formed and the metal itself. This scale will flake off more readily with fluctuations in temperature than if the temperature was held constant. For this reason, a higher temperature for continuous service is shown for the chromium nickel stainless steels.

PINCO
INSULATORS

The design characteristics shown in the Pinco L 735 have proved their superiority by "right on the job" performance in years of widely varied service on all voltages. The abilities and facilities responsible for this and other outstanding examples of Pinco pioneering leadership in insulator and special porcelain design and manufacture are at your service.



PINCO L 735
SPECIFICATIONS

Dry Flashover ..... 160,000 volts
Wet Flashover ..... 95,000 volts
Leakage Distance ..... 33"
Torsion Strength in lbs. ... 40,000
Tension Strength, lbs. 20,000

A few years back, all switch and bus units were made with a short second shell which invited the possibility of cascading in stacks. That is, up until Pinco introduced the revolutionary new L 735 switch and bus stacking unit. With rugged porcelain, a larger second shell and an improved center design, this new unit showed far superior flashover performance and greatly reduced the tendency to cascade. It also provided added leakage protection and increased mechanical strength.

Today, this idea like many others pioneered by Pinco, is an accepted industry standard . . . further evidence that Pinco is constantly primed to keep abreast of industry requirements. So whether your insulator requirements are ordinary or extraordinary—the services of the entire Pinco organization are yours to command.

See Page 118 Pinco Catalog No. 49
for complete electrical and mechanical specifications.

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.
Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO
INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain.

Utilize the flexibility of

...for continuous and uninterrupted

Check this Flexibility

- √ *Variety of bridge circuits... Wheatstone, Kelvin, Impedance, resistance thermometer, thermocouple, etc.*
- √ *Variety of auxiliary switches for audible or visual alarms.*
- √ *Variety of chart speeds—½" to 120" per hour.*
- √ *Variety of printing speeds—1 to 30 seconds.*

THE flexibility of the entire line of Brown instruments makes available a variety of combinations well qualified to meet the measuring, recording and signalling demands of any power plant. And the standardization and interchangeability of components simplify maintenance and stocking of parts.

Applicable to the measurement of temperature, pressure, flow, power, current, frequency, speed, pH and conductivity... such flexibility in measuring variables is easily obtained by changing the bridge circuit and primary sensing element.

Check the flexibility features... then call in our local engineering representative for a discussion of how they can add to your operating efficiency.

Dependability, Too!

The dependability you demand from your recording instruments is insured by the *ElectroniK* Potentiometer... by the dependability of its primary and vital components which are life-tested, service proven, and designed for minimum and easy maintenance. It takes little more than a glance to appreciate the ruggedness of the positive balancing motor, the hermetically-sealed converter, the simplified continuous balance amplifier... as well as the minimum of moving parts and the obvious freedom from adverse effect of dust and atmospheric moisture.

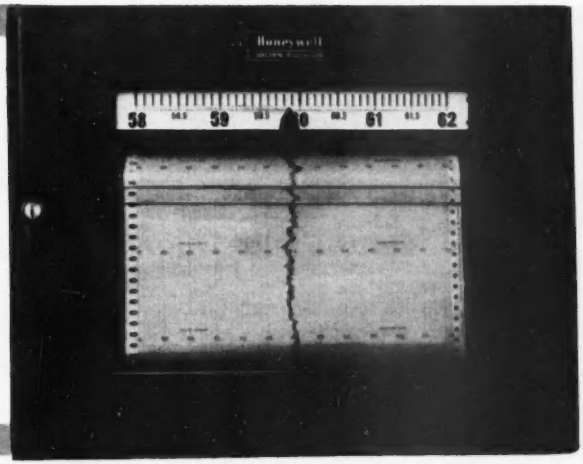
ElectroniK Potentiometers

frequency measurement...

THE *ElectroniK* FREQUENCY RECORDER

Important Features

- *Continuous Balance measuring system—with electronic non-cyclic balancing—not mechanical in operation.*
- *Frequency change as small as 0.01 cps initiates rebalancing action.*
- *Calibrated accuracy within 0.025 cps at normal frequency.*
- *Unit construction eliminates delicate mechanical linkages . . . assures long trouble-free operation with minimum of maintenance.*



THE *ElectroniK* Frequency Recorder is a *must* for central stations and systems offices. It provides an *uninterrupted* check on generator performance by its instantaneous measurement of frequency . . . furnishes accurate, permanent records . . . and makes load dispatching easier.

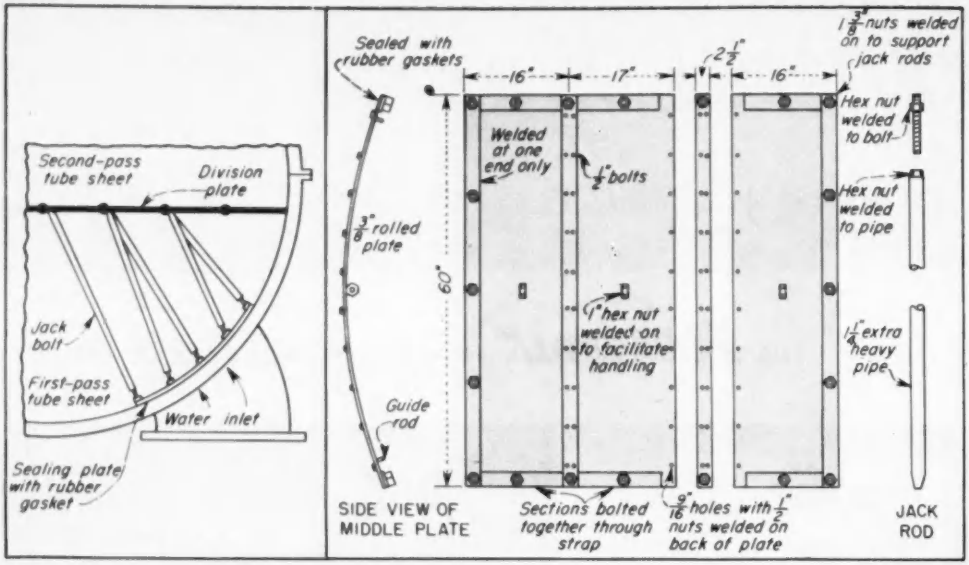
Operating on the electronic "continuous balance" principle, the recorder features unusual sensitivity and dependability. Its balancing motor and mechanism move only during a frequency change, thus reducing wear of parts to an absolute minimum. Its scale—12 inches wide—makes for easy readability at a distance, for checking the direction and amount of frequency deviation.

MINNEAPOLIS-HONEYWELL REGULATOR Co., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

● *Important Reference Data*

For more detailed information, write for Data Sheet No. 9.1-8 . . . and new Catalog No. 90-2, "Supervisory Instruments for Power Generation."



SEALING ASSEMBLY is held firmly in position over water inlet (left) by jackbolts during washing of condenser. Illustration at right shows details of fabrication which allow sealing plate to be disassembled for passage through condenser manhole

Seal Condenser Inlet During Chemical Washing

W. E. ADAMS
Mechanical Maintenance Dept
Beech Bottom Power Co
Power, West Virginia

A sealing assembly has been developed to keep the water inlet of steam condensers closed during chemical washing. This method has solved a problem at a reasonable cost because the assembly has an indefinitely long life, and the seal is readily applied.

The method resulted from the practice of acid and caustic washing of main condensers at Windsor plant. Since there were no valves between the inlet gate and the condenser water box, dilution of the cleaning solution occurred or else the solution was lost by leakage through the inlet gate. The loss of the cleaning medium causes considerable monetary loss and also defeats the purpose of the cleaning program.

As shown in the sketches, curved-steel sealing plates were fabricated in three bolted sections. The plates can be passed through the water-box manhole and assembled to fit over the condenser-inlet opening. Since the surface upon which the plates have to rest is cast iron and slightly irregular, a ½-in. thick live-rubber gasket is used between the plates and condenser shell to provide a water-tight joint. The same gasket material is used to seal the joints where the three sections are bolted together.

Jack bolts of various lengths are used to hold the plates firmly in the proper position. These jack bolts extend from sockets provided by nuts welded on the outer edges of the seal plates to the horizontal first-pass division plates overhead. After the jack bolts are placed in position, adjustments are easily made by increasing the length of the bolts, until the plate presses firmly against the gasket.

Field-Clean ACSR Splices In Minutes With Chemical

JORDAN LUMMIS
Transmission Engineer
L. BASKETTE
Senior Chemist
Engineering Dept
Southern California Edison Co
Los Angeles

To clean aluminum conductors in the field prior to splicing, Southern California Edison uses a solution of sodium hydroxide and sodium chromate, followed by a dip in phosphoric acid and rinse in plain water. Cleaning time required under normal temperature conditions is less than five minutes.

Corrosion products and deposits on ACSR in the Edison area of southern California are primarily silicates, sulphates, and oxides of iron and aluminum. They form a black adherent coating on exposed surfaces of individual strands wherever the strands are not in actual contact, and are present to some extent on the inside layers of the strands. Amount of the deposit as a percent of strand weight is approximately 5.5% for the outside layer, 1.3% for the second, and 1.0% for the third.

A 10% solution of sodium hydroxide proved to be the best means

(*Continued on page* 177)

HI-TENSION NEWS *Junior*

25-YEAR-OLD O-B UNITS INSULATE NEW LINE

After 25 years, this line was rebuilt with the original O-B suspension insulators. . . And during those 25 years, these insulators had seen some rugged service. Paralleling a heavily-traveled railroad, the line is constantly exposed to severe contamination and fumes. With the original steel crossarms and inadequate shielding, impulse insulation was low and lightning attack intense. Still the O-B insulators went back into service because these and thousands of others elsewhere on the system had earned the power company's complete confidence. . . For the same feeling of security, make O-B *your* next choice of insulators.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

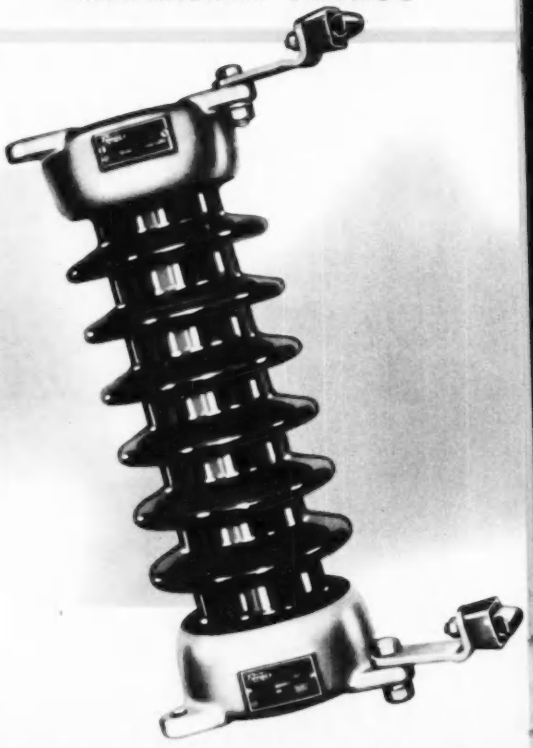
All Alike Just ONE Day

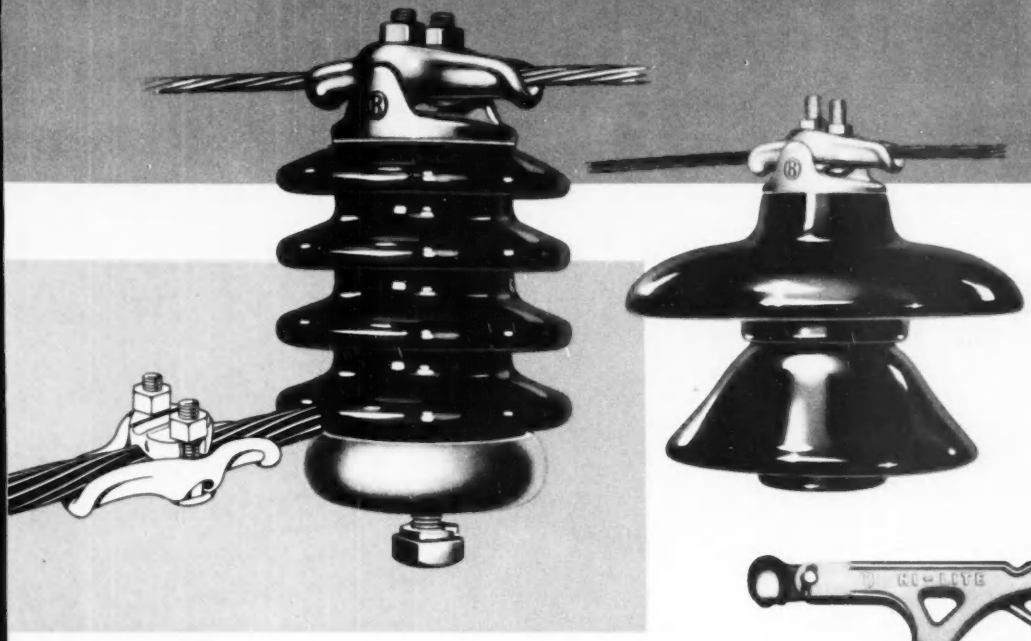
Standards assure you a uniform product when you buy station insulators--uniform the day they are made. But these standards don't specify the *permanence* of these qualities. Durability can't be covered in a set of specifications. It's an unknown factor until you lose it. *Then* you can count your insulator dollars and see if you got a bargain, after it's too late to correct. . . Hundreds of power companies with better than a generation of experience to go on have found how to correct this problem right at the start, however. Put O-B station insulators to work and enjoy the confidence they have earned for nearly 40 years.

Makes a GOOD Insulator BETTER

Put the O-B Clamptop on either a pintype or a post and you get a tie connection that can't be duplicated for strength or permanence by any hand serve. Getting rid of the serve also cuts valuable pole-top time, saves a length of tie wire, and greatly simplifies hot stick work. . . Two simple hex nuts replace all serving operations and require only an ordinary wrench to do a 100 per cent job, *that stays done!* . . . Investigate the speed and simplicity of using O-B Clamptops. It will pay you.

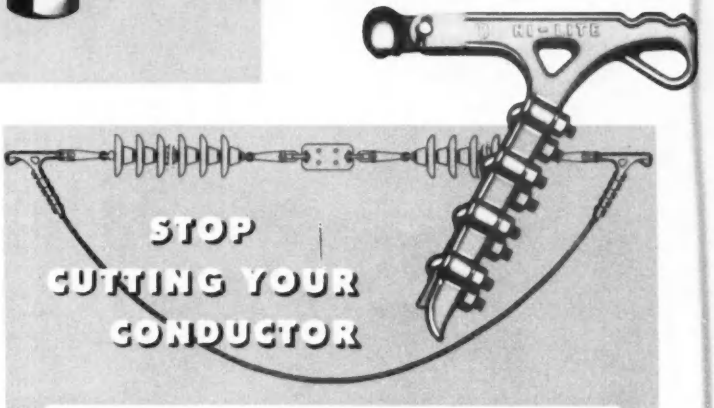
Maximum Values





Make Sense

Lightning arrester buyers have often expressed a desire for catalog listings that include *both* average values and tolerance, added up, and stated as "maximum" protective level. Since tolerance cannot be ignored; why not boldly state it? . . . In O-B's new booklet on Thorex lightning arresters we have done just that--showing average values and *maximum values* listed side-by-side for every item. Readers may see at a glance the information they really want. . . They can also see at a glance how much real protection they get when they specify O-B Thorex.



Power conductors don't have to be cut to form jumper loops at strain points--in fact by *not* cutting them you avoid a potential source of serious future trouble. . . O-B Hi-Lite strain clamps attach to the continuous cable in a matter of minutes; take no more equipment than a common hand wrench; call for no special skill; develop the cable's full working strength; can easily be inspected at any time to ascertain full holding power. . . Basically inexpensive both to buy and to use, O-B Hi-Lite strain clamps make possible the modern continuous jumper loop that improves line reliability; and they save money as well.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

Not Only Cheap to Buy

...they STAY Cheap!

Are you *sure* all low voltage pintype insulators cost about the same? What does it cost to dispatch a line crew at night to run down an unnecessary insulator failure? That insulator may cost a hundred times what you paid for it! . . . Lightning resistance is a big factor here. A small pintype can't prevent lightning, but it can survive it! That is, it can if it's made properly. . . O-B has applied the talents of the finest electrical laboratory in the insulator business to the problem of lightning damage. We have come up with an insulator, even in the smallest sizes, that will resist the most severe strokes--one that flashes over instead of punctures. You don't pay extra for this and you can't see it in the product, but you won't lay out a hundred times its cost just to hunt it down some stormy night. O-B low voltage pintype insulators are not only cheap to buy--they *stay* cheap!

Ohio Brass

MANSFIELD, OHIO, U.S.A.

ACSR Splicing

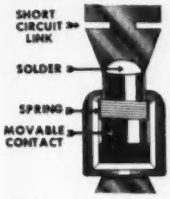
(*Continued from page 172*)

FIELD-CLEANING ACSR for splicing is done quickly and easily with chemicals

of removing the scale in a short time with comparatively slight effect on the bare aluminum and galvanized surfaces. Used at normal atmospheric temperature of 25C, it accomplished the desired cleaning in 2-3 min. Further investigation showed it to be desirable to add 10% potassium chromate as an inhibiter to minimize the action on the bare aluminum.

During removal of the scale deposit the caustic solution penetrates to the inner strands of the cable, and must later be washed out with fresh water. Any residual alkali then can be neutralized by a dip in 5% phosphoric acid, after which a final water wash completes the cleaning operation. With reasonably good washing the

TELESCOPING TUBES are self-contained; cap serves as carrying handle. Bottles contain solutions of sodium hydroxide plus sodium chromate; phosphoric acid; and water

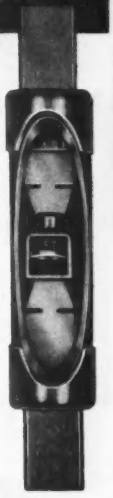


When the tripping temperature of the Trion's Therm-A-Trip melts the contact release, the movable contact driven by its heavy spring opens the circuit.

It takes a long time to heat a block of copper hot enough to melt a piece of solder attached to it. Trion's patented contact-release works in the same way. The solder of its contact-release melts only when the copper mass of its movable contact becomes sufficiently hot.

Trion's Therm-A-Trip element of solid copper is matched to the thermal capacity of the motor or transformer it protects.

Trion blows only when temperatures rise due to "sustained" over-currents. It has the longest safe time-delay of any fuse — five times longer than ordinary fuses. Thus does it give fullest protection and prevent many unnecessary shut-downs.



Trion PROTECTS 3 WAYS

1 *Short Circuit Protection:*
Instantaneous cut-off on a short circuit. The short circuit link blows instantly.

2 *Overload Protection:*
THERM-A-TRIP's positive matched heat control — with the longest safe time-lag of any overload protective device — provides safe starting for motors, and protection from single phasing.

3 *Cooling:*
Trion's lower watt loss makes it the coolest operating fuse of any type. Trion prevents overheating of switches and fuse clips.

A TRION FOR EVERY CIRCUIT. Trions are available in 141 Standard Sizes ranging from 1 to 600 amps for both 250 and 600 Volt circuits. Other sizes for these same voltages range from 1/10 amp to 9 amps. Midget Sizes (3/8" dia. by 1 1/2" long) vary from 1/10 amp to 10 amps. ASK FOR TRION OR WRITE FOR FREE TRION BULLETIN #506-A TODAY.

REGISTERED UNITED STATES PATENT OFFICE
Est. 1893

Trion – Always At The Switch

THE **CHASE-SHAWMUT** CO.
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Bermico Fibre Conduit is made from sturdy wood fibre, impregnated with pitch. Its light 8-foot lengths handle easily, quickly. All joints are precision milled for speedy installation. Specially designed couplings won't split. It is water- and acid-resistant, chemically inert. Complete line of bends. Smooth inside bore insures quick pull-through without abrasion. Bermico's quality, uniformity and dependability have made it a standard of the industry for 25 years. For superior cable protection, specify *Bermico* Conduit!

"SAY...THAT'S FOR ME!"

Distributed by

WESTINGHOUSE

Electric Supply Company

Offices in principal cities

BROWN *Company*

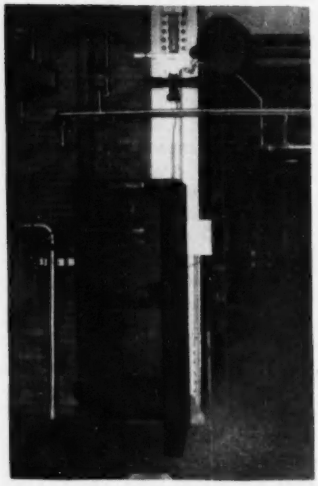
Berlin, NEW HAMPSHIRE

SOLKA & CELLATE PULPS · SOLKA-FLOC · NIBROC PAPERS · NIBROC TOWELS · NIBROC KOWTOWLS · BERMICO SEWER PIPE, CONDUIT & CORES · ONCO INSOLES · CHEMICALS

final phosphoric acid dip could be eliminated, although a slight amount of caustic would then be left inside the cable.

For convenient cleaning in the field the two solutions and rinse water are put in three telescoping tubes, slotted at the top to be held together like a tripod by a ring. The lye solution is put in one tube, plain water in the second, and acid in the third. Simple step-by-step directions are written on brass instruction plates on each of the tubes, leaving no room for doubt as to procedure.

Basic Requirements for Station P-A Systems-I



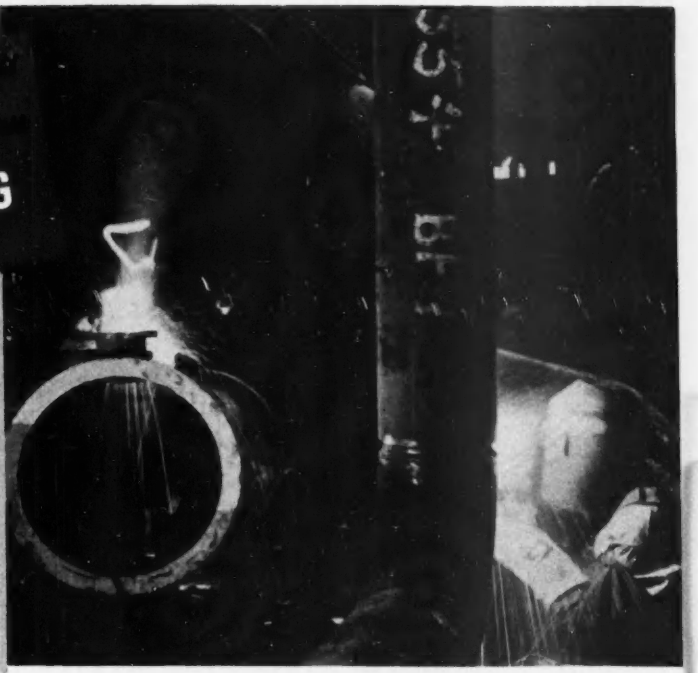
LOUD SPEAKER and soundproof booth with handset and intercom phone are located conveniently in the area of the machine shop

S. C. BARTLETT
Electronics and Communications Section
American Gas and Electric Service Corp
New York, N. Y.

Public-address systems have become essential in power stations for coordinating normal and emergency operations. Four basic requirements for systems are: (1) Instant contact with all operating areas; (2) adequate fidelity; (3) high intelligibility even in highest noise areas; and (4) sufficient flexibility for use both in the office and outdoors.

To be practicable the system must be reliable and simple and must require minimum overall expense (first cost and maintenance). Units must be

M. W. KELLOGG



American Gas & Electric Service Corp.
Boston Edison Co.
Central Hudson Gas & Electric Co.
Chaudronneries A. F. Smulders (Belgium)
Compania Argentina De Electricidad (Argentina)
Compania De Fuerza Del Suroeste De Mexico S.A. (Mexico)
Consolidated Edison Co. of N. Y.
Detroit Edison Co.
Dow Chemical Co.
Elektricitetsselskabet Isefjordvaerket (Denmark)
Ford Motor Co. of Canada Ltd. (Canada)
General Electric Co.
Hartford Electric Light Co.
Houilleres Du Bassin De Lorraine (France)
Houilleres Du Bassin Du Nord Et Du Pas-De-Calais (France)
Hydro-Electric Power Commission of Ontario (Canada)
Indiana & Michigan Electric Co.
Interbrabant (Belgium)
Long Island Lighting Co.
Metropolitan Edison Co.
Mexican Light & Power Co. (Mexico)
Monongahela Power Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Palestine Electric Corp., Ltd. (Israel)
Philadelphia Electric Co.
Public Service Co. of Northern Illinois
Public Service Electric & Gas Co. of N. J.
Societe Anonyme John Cockerill (Belgium)
Societa Edison (Italy)
Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)
Societa Meridionale Di Elettricita (Italy)
Sociedad De Electricidad De Rosario (Argentina)
Union D'Electricite (France)
United Illuminating Co.
Westinghouse Electric Corp.
West Penn Power Co.
Wisconsin Public Service Corp.

This kind of welding stands up under 1100F and 2350 PSIG... *because*—

When these welders in Kellogg's Jersey City fabricating shops strike their arcs in welding high-temperature, high-pressure power piping for a modern steam-powered central utility station, their expertness is backed by much more than personal know-how.

The beads they lay can be counted on to stand up because of the outstanding amount of welding technology acquired by Kellogg during the three decades it has been servicing this vital industry. From carbon steel, through low alloy steel, to stainless steels for handling temperatures now exceeding 1100 F and pressures of 2350 psig, Kellogg has fabricated literally miles of this critical equipment. These welders can call on the knowledge gained in more than 80,000 man-hours spent just in welding alloy piping alone.

They have behind them one of the most complete metallurgical laboratories in the country . . . a special welding-technique development section . . . experience gathered in collaborative research with the leading turbine, boiler and steel manufacturers of the country . . . the most up-to-date non-destructive testing equipment available.

It is because of such men and their firm technological backing, that Kellogg is specified again and again by important power companies for critical power piping jobs all over the world.

OTHER FABRICATED PRODUCTS including:
Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchangers . . . Process Piping . . . Bends and Headers . . . Giant One-Piece Bends . . . Forged and Welded Fittings . . . Radial Brick Chimneys

for 51 years an integral part of industrial progress!

The M. W. Kellogg Company (A Subsidiary of Pullman Incorporated)
Offices in New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.

located where they will give the best service.

First cost should not exceed 1/20 of 1% of plant value. It should be readily recovered by improved personnel efficiency, plant performance, and reduction of damage during emergencies.

Maintenance expense will be very little if simple, straight-forward circuits, few tubes, and no duplicate equipment are used. Maintenance can then be handled by anyone with average understanding of audio circuits if equipped with basic tools and a volt-ohm meter. Tubes can be checked by interchanging with new tubes and observing tube voltages and currents.

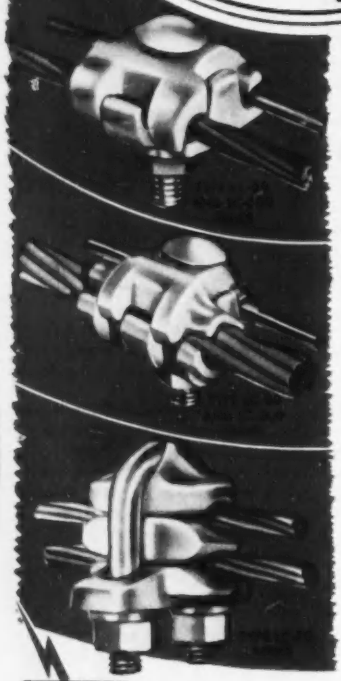
Power output level can be checked by observing the voltage across the speaker circuit, using voice or whistle as input to microphone. Handsets and cords are subject to most damage. Speakers seldom give trouble. To expedite maintenance, stocks should be kept of spare tubes, filter condensers, handsets, and cords.

High noise levels (80-120 db above the threshold of hearing) and reverberation of sounds constitute real problems. Hence it is desirable to serve large areas with the necessary number of properly located small units (averaging 10 w per speaker) each serving a small area. For a single-unit plant, 250 w total in speakers is usually practicable.

Requirements relating to equipment —speakers, microphones, tubes, amplifiers, and cable—will be presented in Basic Requirements of Station PA Systems—II in an ensueing issue of Electrical World.

STOP CONNECTOR CORROSION FAILURES WITH

TYPE LC CAST ALUMINUM CONNECTORS FOR Aluminum Distribution Systems



Designed for connecting A.C.S.R. to A.C.S.R. or A.C.S.R. to copper, amerductor and copperweld conductors.

Failures of plated copper or copper alloy connectors installed on A.C.S.R. result from high resistance destructive corrosion of contact surfaces which occurs when copper bleeds through plating causing an electrolytic action with aluminum conductor strands.

Insure against corrosion—specify Type LC —connectors with clamping members of heat treated cast aluminum alloy No. 195 —conductor grooves for copper, amerductor and copperweld conductors incorporate heavy copper liners bonded to connector body by a proven special process.

Backed by many years of coordinated electrical, mechanical and metallurgical engineering knowledge and experience in the design and manufacture of cast aluminum electrical products.

Consult one of our nearest 18 representatives or contact our main office.

Write today for Catalog Sheets U-3, U-5 and U-6.

ABW OUR PRODUCTS ARE QUALITY CONTROLLED FROM INGOT TO FINISHED PRODUCT

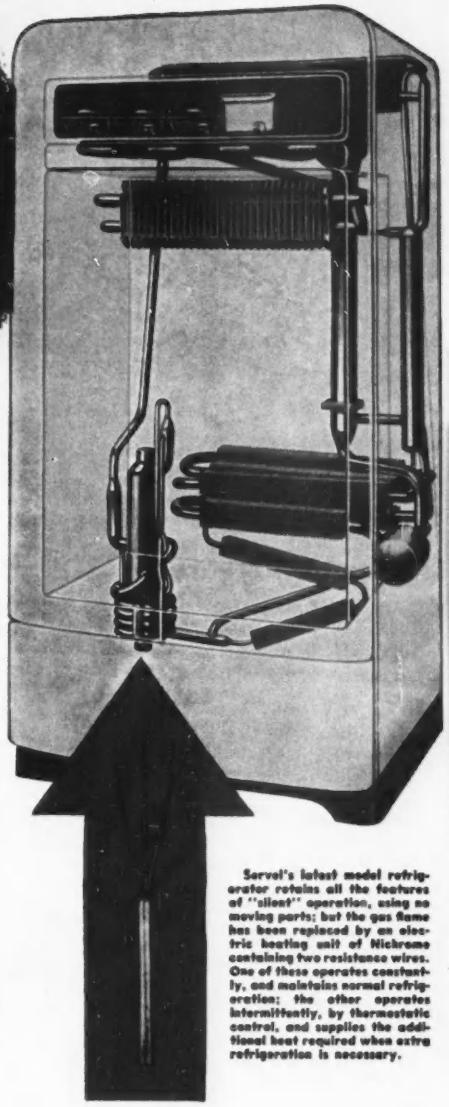
ANDERSON BRASS WORKS, Inc.
POST OFFICE DRAWER 2151
BIRMINGHAM, 1, ALABAMA

Going to miss the AIEE WINTER GENERAL MEETING?

Then don't miss Electrical World's special report of the meeting in the

FEBRUARY 11th ISSUE

Servel goes electric with NICHROME*



Servel's latest model refrigerator retains all the features of "silent" operation, using no moving parts; but the gas flame has been replaced by an electric heating unit of Nichrome containing two resistance wires. One of these operates constantly, and maintains normal refrigeration; the other operates intermittently, by thermostatic control, and supplies the additional heat required when extra refrigeration is necessary.

Now the famous silent Servel refrigerator operates on electricity. In the new refrigerator, a simple electric heating element provides heat for operating this absorption-type system. Just plug it in, and the new Servel goes to work . . . provides the *soundless* performance for which it is famous.

Since cold is obtained without a single moving part by means of heat applied to the system, the small heating element is the vital part of the new Servel. Every operation of the refrigeration cycle, indeed, depends upon the heater unit *staying on the job.*

Because of this, Servel has adopted heating elements made with Nichrome—the electrical resistance alloy that is the very heart of quality appliances everywhere. Remarkably resistant to high heat and corrosion, and able to retain its physical and electrical properties despite thermal shock resulting from intermittent operation day in and day out, Nichrome assures Servel of efficient operation and a lifetime of dependable service.

Whatever *your* requirements for electrical resistance material, it will profit you to consult with us. In addition to world-famous Nichrome and Nichrome V, we produce over 80 alloys to meet the varied needs of the electrical and electronic fields. Although strategic materials and the alloys we make from them are on strict allocation at the present time, we'll be pleased to serve you to the best of our ability.

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

* T. M. REG. U. S. PAT. OFF.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

General Electric Co

INDUCTION HEATER has cut coupling bolt hardening costs 70% and given distortion-free hardening of each piece, thus allowing machining of soft metal before hardening. Heater has also cut "lead time" on the hardening operation from three days to a few hours

Induction Heater Ups Production

Use of induction heater at the De Laval Steam Turbine Co, Trenton, N. J., has cut coupling bolt hardening costs 70% according to S. P. Felix, superintendent of the company's Standard Products Division.

Used for hardening bolts after machining, the induction heat process also gives them correct hardness and distortion-free properties, he said.

"We formerly had to harden a piece first, then machine it. But now, with induction heating, we can finish machine it, then harden it. The result is as distortion-free as if we had machined it after hardening. This has eliminated two operations."

"Lead time" on the hardening operation has been cut from three days to a few hours on a given batch, Felix said. Formerly, the company had to heat furnaces for small runs, or hold jobs until enough pieces had accumulated to justify a run. This slowed down production and increased "lead time," he said.

Before installation of the heater, the company used a carburizing process. According to Felix, De Laval installed the heater "in order to reduce the number of operations, which in turn would decrease our costs."

He also emphasized that use of induction heating gives them better control of the depth of heating, which determines the quality of each piece. Induction heating is said to be cooler, cleaner, and safer than the carburizing process it replaced.

"Island Lights" Do Double Duty on Airport Ramp

Dome-shaped reflectors mounted on pipe standards provide a high intensity of illumination for both the passenger and the ramp loading areas at the Allentown-Bethlehem-Easton new airport administration building. Lights of this type are normally used to illuminate gasoline service station pump "islands," but they do an excellent lighting job of both areas at this airport without throwing any light out on the field where it would be disturbing to pilots while landing, taking off, or taxiing. In addition, this type light does not throw any light upward where it might annoy control tower personnel or be confused by pilots with any of the landing aid lights.

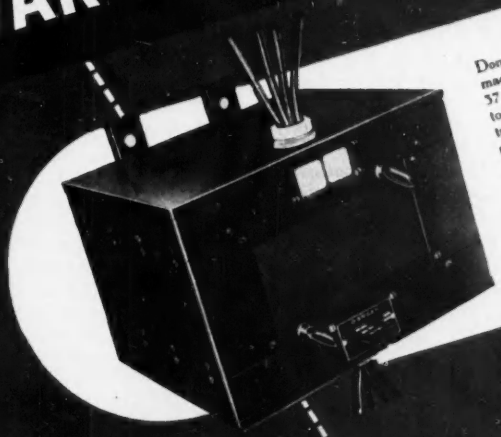
Westinghouse Electric Corp

HIGH LEVEL LIGHTING is provided on airport ramp by "gas station" type dome lights without throwing any disturbing spill light out on the field or up to the control tower.

The lights are spaced about 15 feet apart along the fence line and their mounting height is about 13 feet above the ground level. 200-w lamps are used in the 18-inch diameter reflectors. Note the six 1500-w floodlights mounted on the roof of the building to augment the other lights and to provide more intensity on the outer loading ramp. It is planned to install visors on these floodlights to cut off the light at the outer ramp.

This new building as well as the expanded airport facilities was designed by Michael Baker, Jr, Inc, of Rochester, Pa.

DONGAN *Transformers*
ARE INSULATED WITH
NATVAR Varnished Cambric

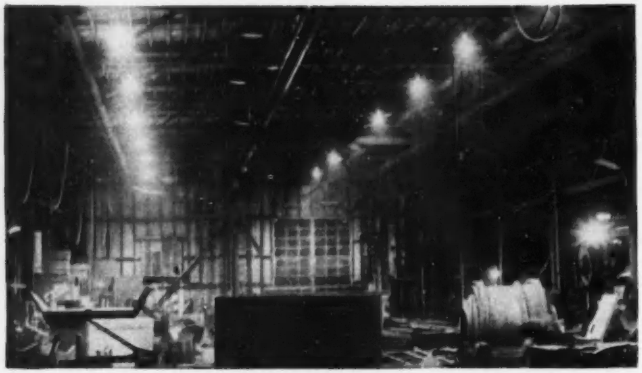


Dongan power circuit transformers are made in capacities from .050 KVA to 37.5 KVA, single phase and from 3 KVA to 30 KVA, three phase. Single phase transformers have two primaries and two secondaries which can be connected either in series or in parallel. Dongan #35-1000, illustrated, is rated 10 KVA; primary, 460/230 volts; secondary, 230/115 volts; 50/60 cycles. Natvar varnished cambric is used as insulation between the four windings and also as an outside wrap for the entire coil assembly.

Natvar Products

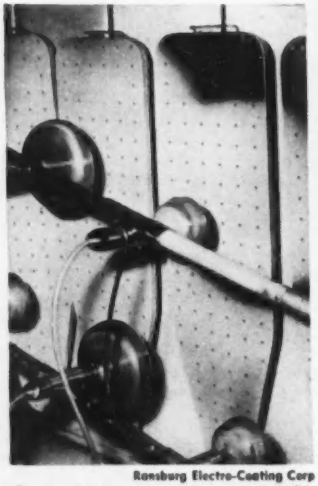
- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

Ask for Catalog No. 22



Reflector Lamps Cut Maintenance

High bay lighting of the plate and welding shop of Western Machinery Co, Sacramento, Cal., with sixteen 750-w R-52 reflector lamps has increased intensity to average of 23 ft-c. Formerly it was 5 ft-c. A high degree of comfort due to the sharp cut-off of light has improved employee morale according to management. Employees say they feel better physically at the end of the day. Low cost of installation, high utilization, and maintenance-free operation are features of advantageous incandescent system. Lamp spacing is 19 by 25 ft with 24 ft mounting height. Wm. J. Flynn, Lighting Representative, Sacramento Municipal Utility District, Sacramento, Cal.



Ransburg Electro-Coating Corp

Cuts Painting Costs 25%

Painting metal by electrostatic atomization and deposition at Geuder, Paeschke & Frey Co, Milwaukee, Wis., reduced painting costs 25% over former hand methods. Considerably less adjustment is required and quality is improved with less hand touch-up. Metal ironing boards are painted with one coat of white enamel on both sides using conventional spray gun.

Ultraviolet Protects Meats

Meat protection by ultraviolet lamps at Julius Stein Co, Philadelphia, Pa., promotes sanitary conditions, and minimizes trimming after aging and storage. Cuts of meats prepared for market and refrigerated for only short periods of time also have quality and appearance protected with the ultraviolet. Storage atmosphere is kept fresh and pleasant. Lamps are rated 16 w each and have a rated life of 12,000 hr. L. Albertson, Application Engineer, Market Studies and Service Division, Philadelphia Electric Company.

INDUSTRIAL BRIEFS

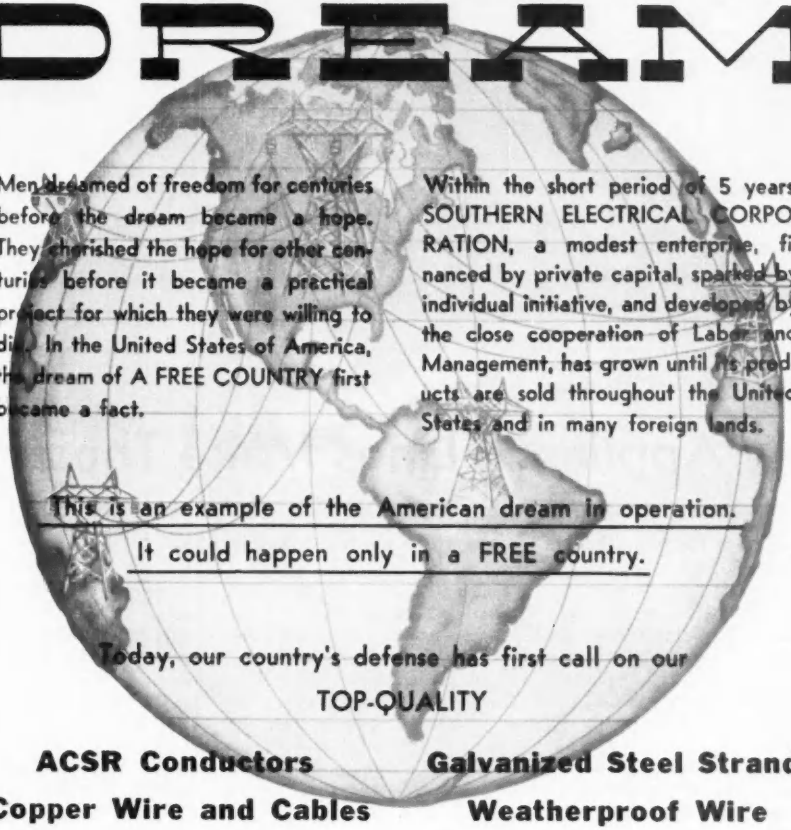
Process Steam by 10-kw electric steam generators at Ideal Glove Co., Pennville, Ind., substantially reduces maintenance cost over previously-used fuel fired boiler. Generator has been used 3 yrs. Operating cost is comparable with former cost of fuel. Steam is used for forming each finished glove to good fit and better sales appeal. Total cost of electric energy averages less than ¼¢ per pair of gloves. Generator is mounted under the form bench, occupying very little floor space and making a compact low-cost installation. Charles Marks, Industrial Power Engineer, Indiana & Michigan Electric Co., Marion, Indiana.

Radio Dispatching System between industrial truck operators and a central dispatching office has greatly speeded up and organized intraplant shipments at the Westinghouse Appliance Division Plant, Mansfield, Ohio. Two-way communication enables one dispatcher to handle entire fleet of trucks by keeping an up-to-the-minute record of truck operators' call-in reports. Any truck operator in the plant can be given shipment orders along with all essential information as to the most accessible storeroom possessing the proper quantities of the materials to be moved.

Heating Compressed Air with 60 electric steel sheath fin resistance heaters at the National Advisory Committee for Aeronautics, Cleveland, Ohio, provided high heat transfer area and eliminated oxidation between fins and sheath. Live heating elements are not exposed to the air stream. These heaters are economical in operation. They are compact and easy to install. Dry compressed air is heated from 60 F to 400 F at a rate of 3½ lb per sec. Driver-Harris Company.

Electric trucks save over 18 man-hr per car of foundry supplies at Draper Corp., Hopedale, Mass., over hand trucking. Five men working 6 hr with electric fork truck and pallets can unload and warehouse a 40-ton car of cement formerly requiring 6 men working full 8-hr shifts. Looms for export shipment are precision-spotted in packing cases in minutes instead of hours. Company operates 54 electric trucks.

THE AMERICAN DREAM



Men dreamed of freedom for centuries before the dream became a hope. They cherished the hope for other centuries before it became a practical project for which they were willing to die. In the United States of America, the dream of A FREE COUNTRY first became a fact.

Within the short period of 5 years, SOUTHERN ELECTRICAL CORPORATION, a modest enterprise, financed by private capital, sparked by individual initiative, and developed by the close cooperation of Labor and Management, has grown until its products are sold throughout the United States and in many foreign lands.

This is an example of the American dream in operation.

It could happen only in a FREE country.

Today, our country's defense has first call on our TOP-QUALITY

ACSR Conductors
Copper Wire and Cables
ACSR Accessories

Galvanized Steel Strand
Weatherproof Wire
(Aluminum or Copper)

But we will serve YOUR needs to the best of our ability.

SOUTHERN QUALITY
MEETS EVERY TEST
Phone 7-3325

SOUTHERN SERVICE
EXCELS THE REST
P.O. Box 989

Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

H. A. Valencourt, Nash Kelvinator, Fred Lehman, May Stern Co, Pittsburgh and Frank Kelley, Nash Kelvinator, look over display which explains features of Kelvinator's new automatic defrosting cycle

L. E. Hoxsie, Hotpoint, right, explains small instant-heat element in his company's new line to Mr. and Mrs. H. M. Long of the L & K Electric Co, Binghamton, N. Y.

New Appliance Lines Make Their Bows

Automatic defrosting refrigerators, double-oven ranges, refinements in television sets, and more powerful vacuum cleaners feature white goods shows in Chicago

Changes in vacuum cleaners and refrigerators were among the more conspicuous features at the appliance shows in the Furniture Mart and the Merchandise Mart in Chicago during the weeks of Jan. 7 and Jan. 14. The Jet 99 Universal cleaner featured by Landers Frary & Clark has a motor only slightly under one horsepower, being rated 690 watts at 115 volts. It is a plug-in appliance and has an air displacement of ½ million cubic feet per minute and a water lift of 65 to 68 in.

Apex, showing a canister unit, claims the world's most powerful vacuum cleaner. It has a water lift of 75 to 80 in. and a motor slightly over one horsepower, actually about 900 watts. The "pancake" motor design is said to prevent any light flicker when starting. The paper bag is disposable. The cleaner is 12 in. high and weighs 15 lb.

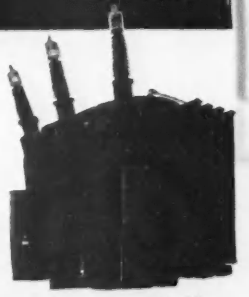
Refrigerators . . . Automatic defrosting is featured in a number of refrigerators. Kelvinator's Magic Cycle self-defrosting unit has a refrigerant line that bypasses the condenser during the defrosting cycle. A clock timer starts the defrosting operation and the change back to normal operation is controlled by a thermostat. Defrosting period is short and frozen foods are kept far below freezing temperature.

John Houserman, General Electric Appliances, Pittsburgh, left, talks up new 11 cu ft freezer to Donald Levinson, Reichart Furniture Co, Wheeling, W. Va.

J. M. McKibben, right, vice president, Westinghouse, gives details on the Bell-Ringer contest in the Westinghouse Frost-Free exhibit as Marney Letts of Union Electric Co looks on

for *Power Transformers* of *Superior Performance*

WHEN you specify **Moloney Power Transformers** you are specifying *"superior performance."* For over 50 years Moloney has been accumulating experience, skill and facilities to make this possible. You will know beforehand that from your Moloney Transformer, which can be test-proved on our 3,600,000 volt Surge Generator, you can expect *better* performance, *greater* reliability and *less* maintenance expense.



MOLONEY ELECTRIC COMPANY

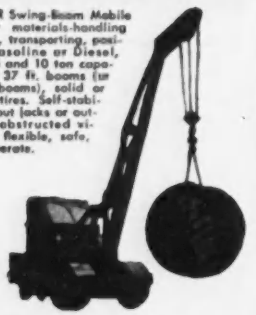
Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

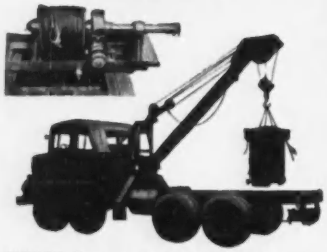
MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Cranes: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.





WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck; Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or rocking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR No. 70—Truck Equipment

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5, AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
362 63rd ST. BROOKLYN 20, NEW YORK

Automatic defrosting is included in Admiral's 9-and 11-cu ft models. Defrosting is accomplished with a heating element on the evaporator. The cycle is turned on automatically once a day and is turned off automatically when the defrosting operation has been completed.

"Clothes lines are for the birds" was a feature of the Westinghouse automatic washer exhibit. Artist at left has sketched a picture of visitor at right with the exhibit as background

Separate freezing and refrigerator compartments are incorporated in Hotpoint's lines of refrigerators and freezers.

Westinghouse features the Frost Free model which automatically measures the need for defrosting with a counter that counts the door openings. When the door has been opened 60 times the defrosting cycle is cut in. A 375-watt heater on the outside of the refrigerator heats the refrigerant as it returns to the evaporator. The unit is automatically returned to the normal cycle by a thermostatic control.

Norge showed two new refrigerator models with the "Power King" reciprocating compressor unit. All Norge refrigerators in the past have featured the "Rollator" compressor unit.

Shelf space on refrigerator doors is conspicuous on many models this year. Philco's Dairy Bar feature is a notable example.

Ranges . . . Double-oven range models were shown by Westinghouse for the first time. Hotpoint played up a very fast "instant heat" surface unit on ranges. On Hotpoint's top range models pushbutton controls and full length lamps were also featured. Norge was showing a "Pick-a-Pan" feature in ranges. In the storage section pans hang on a bar that slides out to permit convenient selection by the housewife.

A quick-set timer which is said to simplify automatic cooking is a new feature of the Philco range.

Television . . . In TV, Admiral showed models with built-in radios and phonographs. Another Admiral feature is a turret tuner that can be converted to receive telecasts from new UHF stations.

An area selector switch which makes circuit modifications for "close in," suburban, or "fringe" area conditions was shown by Motorola. It is said to give most sensitive reception for each area and was designed especially for fringe areas. Other new features with Motorola are the concentrated power chassis and the acoustinator tone control.

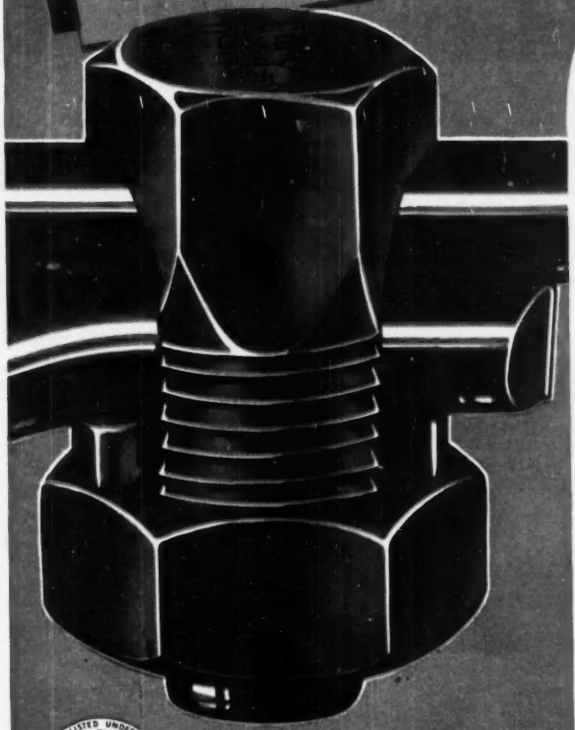
Freezers . . . An 11-cu ft freezer shown by General Electric takes the same floor space as the former 8-cu ft unit. This was accomplished with a new wire type of condenser with a high heat transfer. The condenser fits rather closely against the back of the freezer in a manner that takes minimum space.

Dishwashers . . . Apex showed a portable automatic dishwasher with high quality performance but without the expense of installation of the regular built-in automatic dishwasher. Capacity was said to be about the same as that of their standard automatic dishwasher. The new unit has a built-in water heater which gives water temperatures of 140, 165 and 200 F for the successive cycles. Water heater is 1250 watts and motor ¼ hp. The storage tank for water makes it unnecessary to keep the washer hose connected to the sink faucet through the entire washing cycle. A one-minute filling period is all that is required.

Hotpoint showed an easier-to-load feature, increased dish capacity and improved washer action in their new automatic dishwasher.

Automatic Washers . . . An automatic washer that requires only 10 lb water pressure was shown by Apex. It is spring mounted to eliminate

These 2 Things Make a GOOD Connection!



LISTED UNDER REEXAMINATION SERVICE UL OF UNDERWRITERS' LABORATORIES, INC.

BLACKBURN *Hi-Strength* CONNECTORS

1

High Pressure Contact Between Wires:

It is fundamental that **high pressure** contacts are **better** electrical contacts. Also, it is necessary to have high pressure to keep the wires from sliding, rolling or moving within the connector, as the power lines sway in the wind. High pressure effectively seals the contact surfaces from moisture and oxidation and produces a lasting low resistance connection. Tests show that BLACKBURN Connectors definitely produce these high pressure contacts.

2

Ability to Maintain This High Pressure Contact:

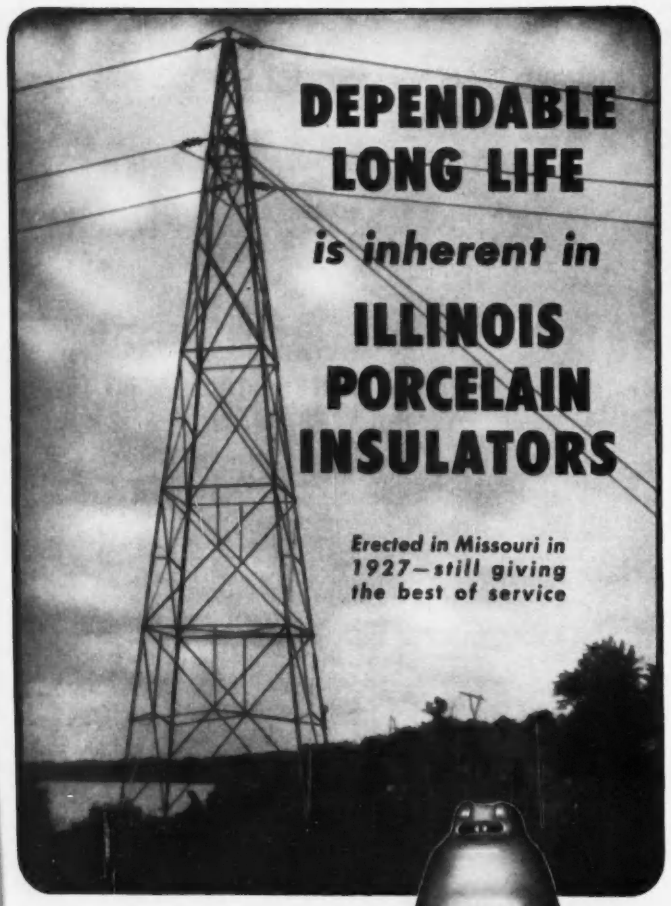
The connector must have sufficient strength to make and **hold** a high pressure connection. It must not yield or stretch and loosen up with time. BLACKBURN Hi-Strength Connectors are made of Duronze, a silicon bronze alloy which is actually stronger than structural steel. They have that **extra strength** so vital to a good connector.

YES, BLACKBURN Hi-Strength Connectors (1) make high pressure connections and (2) have that extra strength required to **hold** the high pressure connection. It pays to use the best—it pays to use BLACKBURN Connectors.

JASPER BLACKBURN CORP.

35 MADISON ST., ST. LOUIS 6, MO.

Phone CEntral 3007

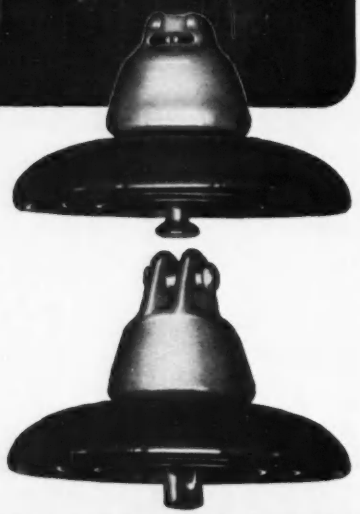


SUSPENSION TYPE INSULATORS

Produced to Illinois' exacting electrical and mechanical standards—completely tested and inspected to insure against breakdown on the job. This, plus a proved record in countless installations like the one pictured above give complete assurance of long years of thoroughly dependable service.

PIN TYPE INSULATORS

Low voltage, high voltage—one piece or multi-part—a complete line of pin type insulators, tested and proved, for every distribution job.



WRITE FOR COMPLETE INFORMATION AND PRICES

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

Left to right J. B. Anger and George F. Kuzell of Norge, E. M. Boltigheimer of Great Western Stores, Louisville, and O. M. Calvert of Norge look over the new Norge refrigerator with the reciprocating compressor

vibration and change from cycle to cycle is accomplished hydraulically, eliminating all gears.

"Fabri-flex" control, for dainty garments was featured in General Electric's new washer. This unit also has a light in the basket and a small-load feature.

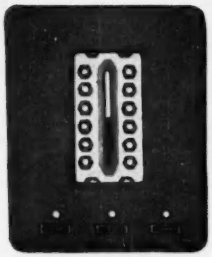
WU Servicing TV

Last spring the Western Union Telegraph Co entered the business of installing and servicing television sets in three northern New Jersey counties, Essex, Passaic, and Union. This was in the nature of an experiment to determine facts and factors necessary to decision on whether or not to expand the undertaking towards ultimate nation-wide coverage. Now, according to Thomas F. McMains, president of Western Union Services, Inc, the operation has been enlarged to take in two more counties, Hudson and Bergen, and to include all makes of sets instead of only Dumont, as at the start. Although the experience last summer was generally favorable to the idea, the first real test of it, said Mr. McMains, is coming this winter when television sales and viewing reach their peak.

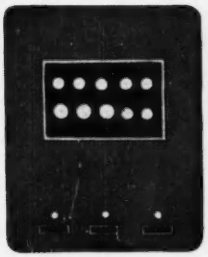
Built-In Cooking Unit

Separate surface cooking and oven units for building into kitchen structures are now being offered by the Presteline Home Appliance Division of Leeson Steel Products Inc, Chicago. Presteline is expanding its distributor franchise program; Breckenridge, Inc, in Boston, and Pacific Telecoin Corp in San Francisco are new distributors.

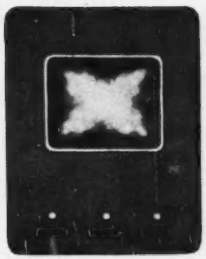
Rapidly Growing LIST OF UTILITIES Using the DIAMOND "UTILISCOPE" (WIRED TELEVISION)



Boiler water level observation



Burner pilot observation



Boiler furnace combustion observation

Stack smoke discharge observation

Utilities listed below have purchased the Diamond "Utiliscope" for one or more of the uses shown. Images are brought to the boiler control panel where the operator can see them at all times.

***Ohio Power Co.**
Tidd Station

***Consolidated Edison Co.**
Hellgate Station
Hudson Avenue Station
Waterside Station
East River Station

***Commonwealth Edison Co.**
Fisk Street Station
Ridgeland Station

***Board of Water & Electric Light Comm.**
Ottawa Station, Lansing, Mich.

***Cincinnati Gas & Electric Co.**
Miami Fort Station
Clermont Station

***Illinois Power Co.**
Wood River Station

***Oklahoma Gas & Electric Co.**
Mustang Station

***Indiana & Michigan Electric Co.**
Twin Branch Station
Tanners Creek Station

***Appalachian Electric Power Co.**
Phillip Sporn Station
Kanawha Station

***Northern Indiana Public Service Co.**
Michigan City Station

Public Service Co. of Indiana
Noblesville Station

Union Electric Power Co.
Venice Station

Northern States Power Co.
Minneapolis Station

***Dayton Power & Light Co.**
Hutchings Station

Buffalo-Niagara Electric Corp.
Huntley Station

***Duke Power Co.**
Dan River Station
Lee Station
Riverbend Station

Union Electric Co. of Missouri
Meramac Station

Elecktricitateetssakskabet
Kydnby Power Station
Isefyordraerkat, Denmark

The "Utiliscope" is simple, stable, remarkably durable. It requires no technical skill for operation. Cost is low and is quickly amortized by labor saving and improved operation. Write for Bulletin 1025 W.

***Niagara Mohawk Power Corp.**
Dunkirk Station
Oswego Station
Huntley Station

***Societa Edison—Centrale diGenova**
Genova, Italy
Piacenza, Italy

Central Hudson Gas & Electric Corp.
Denskammer Station

***Tennessee Valley Authority**
Johnsonville Steam Plant
Widows Creek Plant

Chicago District Electric Generating Corp.
State Line Station

Public Service Co. of Northern Illinois
Station No. 6

Kansas Gas & Electric Co.
Murray Hill Station

***Long Island Lighting Co.**
Port Jefferson Station
Far Rockaway Station
Glenwood Landing Station

Toledo Edison Co.
Acme Station

Philadelphia Electric Co.
Delaware Station

Cleveland Electric Illuminating Co.
Eastlake Plant

Indianapolis Power & Light Co.
White River Station

Virginia Electric Power Co.
Chesterfield Station

***Southern California Edison Co.**
Etiwanda Station

***Repeat orders have been received from these utilities.**

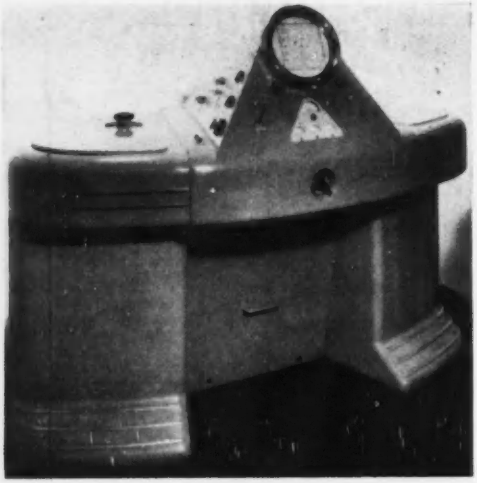
"UTILISCOPE" REGISTERED U. S. PATENT OFFICE

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO • OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited — Windsor, Ontario
Since 1903, Diamond has Manufactured Quality Equipment For Industry

WRITE FOR BULLETIN 1025

4638

NEW EQUIPMENT



Electron Microscope

The new Philips electron microscope has a screen magnification that is continuous from 1,000X to 60,000X. The instrument is capable of producing micrograms of 30 Angstroms resolution or better. Accelerating potentials of 40, 60, 80 and 100 kilovolts are available.

Microscope has a beam oscillator for rapid determination of exact focus. A through focal series is readily obtained by means of an additional fine focus control.

The unit has an extremely large field and permits recording in a single photograph areas which might otherwise require a mosaic of six individual sections.

A retractable breech-type gun assembly uses a preset filament. Console is rugged and has all normal controls easily accessible. Entirely self contained, unit measures 5-ft long, 4-ft high, and 3-ft deep. Approximate total weight is 1,220 lbs. No special mounting is required.

Unit requires three-phase, four-wire ac, 220/380-v 60-cycle supply with neutral wire. Line voltage variations of 5 percent are tolerable.

North American Philips Co, Inc, Mount Vernon, N. Y.

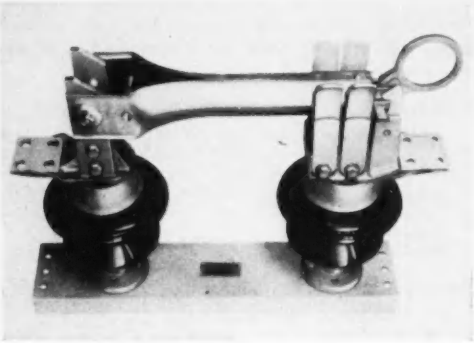
Outdoor Disconnect Switches

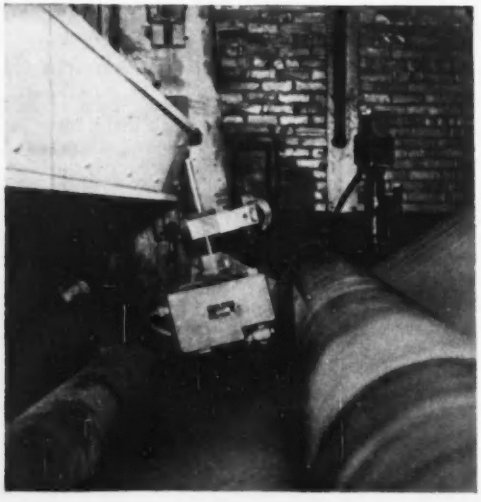
A new line of "B-2K" outdoor hook operated disconnecting switches has been announced by Delta Star Electric Co. Switches are said to incorporate many features formerly found only in group operated switches.

New blade pryout and lock insures smooth, positive operation under all conditions. At the clip end, contact is made by the blade operating against silvered copper hinge bars. Phospor bronze spring cup washers maintain constant pressure on the silvered bars.

Switch is rated from 7.5 to 161 kv and 600 and 1200 amps, for upright, inverted or vertical mounting.

Delta-Star Electric Co, 2437 Fulton St, Chicago 12, Ill.





Tensiometer Control

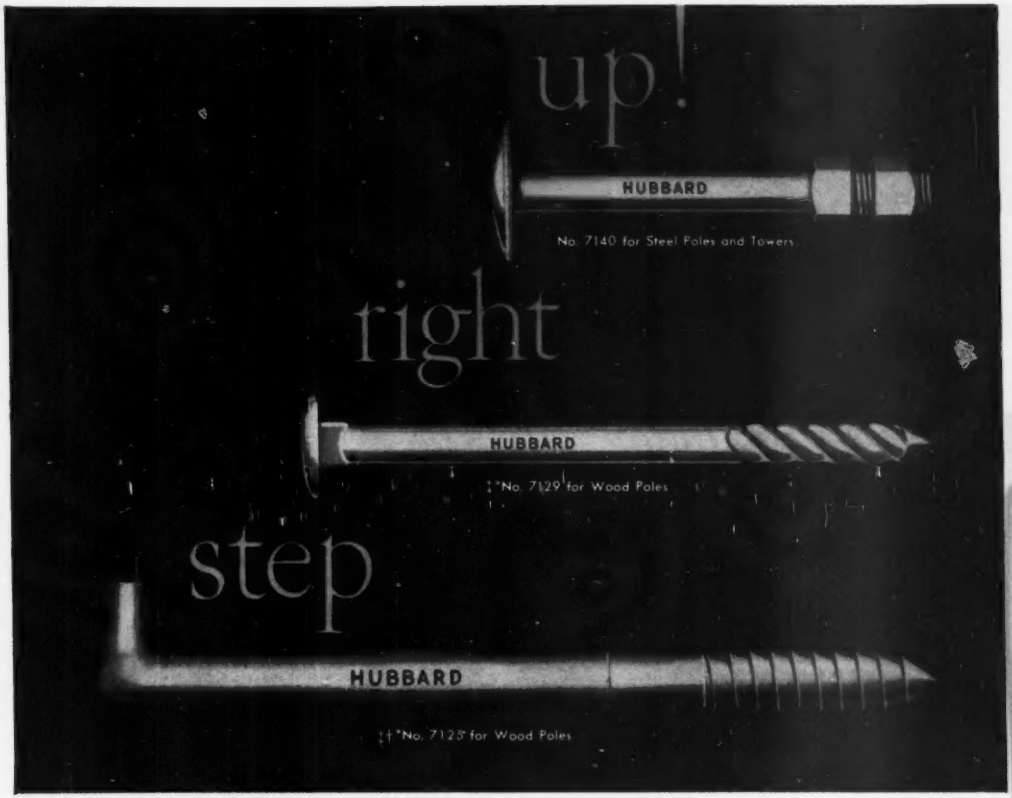
A new device that has increased paper production because of fewer paper breaks and less "down time" at the P. H. Glatfelter Company has been announced by General Electric.

Paper tensiometer controls paper tension automatically and continuously as the processing paper speeds between the calender rolls at hundreds of feet per minute.

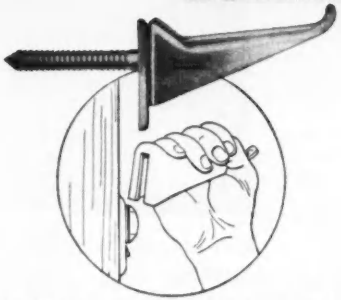
The paper tensiometer when used with an amplidyne sectional drive maintains constant tension regardless of variables affecting tension as freeness, consistency, dryer temperature, moisture content, calender stack loading or friction load variations.

In operation, the small 4-in. roller on the tension head rides on top of the moving sheet of paper so that a slight dimple is depressed into the sheet. Variations in the sheet tension change the air gap of a magnetic structure inside the device which emits a signal proportional to the paper's tension. This is transmitted through the power unit which contains metering circuits, controls and instruments.

General Electric Co, Schenectady 5, N. Y.



HUBBARD POLE STEPS...

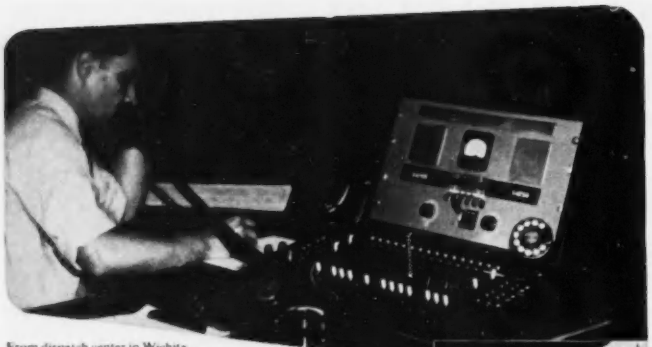


No. 7235 Lag and Plate and No. 7236 Detachable Step are designed to prevent unlicensed climbing. The plate is slipped over the head of the lag and is prevented from turning by a lug in the lower part of the plate.
‡A.A.R. Std. *Western Union Std. †E.E.I. Std.

DESIGNED FOR SAFETY

Hubbard Pole Steps are designed to carry the heaviest human load and to withstand all normal conditions in use, with an ample safety reserve. They are forged from new Open Hearth Steel and bend tests are made periodically, after galvanizing, to check malleability and freedom from embrittlement. All Hook Head Steps have fetter drive threads and marking rings, which indicate proper installation depth and provide a tight seal against water seepage. See Hubbard Catalog No. 50, page 42, for the full line of Hubbard Steps for wood and metal poles, towers and concrete poles.

HUBBARD AND COMPANY
ESTABLISHED 1843
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
"Hang the Load on Hubbard Hardware!"



From dispatch center in Wichita, orders flow out over RCA radio network to all KGE trucks and cars . . . anywhere in area, day and night.

Field superintendent gets trouble call by radio. Directs field crews to outage while he drives there himself.

Radio-directed crews reach trouble in record time. KGE can cover area with fewer trucks, fewer men . . . thanks to RCA 2-way radio.

How a Kansas Utility

Speeds Up Field Operations

with RCA 2-WAY RADIO

Radio directs 107 trucks and cars all over southeastern Kansas for Kansas Gas and Electric Company. Could <u>your</u> business profit from radio, too? Read answer below . . .

Radio Covers 20,000-Square-Mile Area

Kansas Gas and Electric's system spreads out all the way from Kingman 200 miles east to the state line . . . a big territory crisscrossed with vital power lines . . . a job made to order for RCA 2-way radio coverage.

Gives Faster, Better Service

Eight base radio stations blanket the area with main dispatch headquarters at Wichita. Over this network, calls can reach any truck or auto anywhere in the territory. Result: faster service all along the line, less outage time because radio sends the nearest crew to the trouble. Less lost mileage, less wear and tear. More efficient use of men and equipment. And more reliable communications—especially when telephone lines are knocked down by storms. *It's all typical of what RCA 2-way radio can do in any widely spread-out field operation.*

Could Your Business Use 2-Way Radio?

If you operate far-scattered field crews, RCA 2-way radio can save you time and money in dozens of ways. Puts a "phone" in every truck or car. Operates in all weather. Uses standard tubes. Low operational cost. Easy to install and maintain. Mobile units are compact, lightweight, rugged.

Let RCA Help You . . . Now

RCA helps put radio to work for you. Makes initial study. Helps with FCC permit, installation. And nation-wide RCA Service Company handles installation and service if desired. Find out *now* how 2-way radio can save time and money for *you*. Clip and mail coupon for your FREE 2-way radio booklet . . . *today*.

Dept. 45AE
RCA Engineering Products
Camden, N. J.

Please send me my FREE copy of illustrated booklet, "RCA 2-Way Radio for Industry"

Name_____

Title_____

Company_____

Address_____

RCA **RADIO CORPORATION of AMERICA**

Outdoor Motor Control

Originally designed for use on irrigation projects, this rain-tight outdoor motor control is reported applicable to many other outdoor motor control jobs.

Units consist of combination across the line starter with a circuit breaker in a rain-tight enclosure. Built-in start-stop pushbutton or hand-off-auto selector switch is included.

Starters available in NEMA sizes 1 through 5. Standard voltages are 220 v and 440 v.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

•

Alternating Current Recorder

A new, trouble-shooting combination, the TAG recording ammeter used portably with a Weston clamp-ammeter Model 633 is now available for measuring and recording alternating current without breaking the circuit.

Designed to check on and make a permanent record of the use of alternating current and circuit reactions, the combination can be employed to cover all operations within a power,

(*Continued on page* 198)

DESIGNS THAT CAN BE USED FOR REPLACEMENT OR EXTENSIONS IN PRESENT SYSTEMS FOR OVERHEAD OR UNDERGROUND WIRING

Made of Steel or Aluminum

With 22 years of experience and leadership in the design, manufacture and sale of Street Lighting Standards, the UTILITY POLE COMPANY is geared to serve your requirements best. When designing or planning a street lighting installation, remember the name UTILITY POLE COMPANY!

★ **LONGER LIFE**
No place for inside corrosion.

★ **SAFER**
Greater resistance to impact from trucks, automobiles, etc. Poles and Lighting Brackets are strong enough to support more than 200 pounds swinging on end of Lighting Bracket without damage. (Safety for men in re-lamping fixture).

★ **SIMPLER AND LESS EXPENSIVE**
Designs for overhead and underground wiring.

★ **LIGHTING BRACKETS**
One or two light. Lengths—4' to 18'—May be interchanged and maintain same mounting height. Up-sweep type illustrated. Double bend up-sweep and straight arm type with and without scroll available.

★ **WHEN OVERHEAD WIRING USED**
Design can be changed to use underground wiring without removing pole.

★ **STRENGTH**
Can be varied without change of pole diameter. May be increased without removing pole.

★ **UNDERGROUND WIRING**
Protective wire runs are provided in the pole so that electrical cables are carried up the pole in enclosures where they cannot be damaged. (As they are when swinging and rubbing inside a tubular pole).

★ **INSTALLATION SIMPLIFIED**
Anchor Base or Embedded Type Poles, 3 or 4 bolts used (rust resisting if desired). Embedded type has bearing plate on bottom of pole.

★ **HEIGHT**
Can be varied to meet need.

UTILITY POLE CO.

MAIN OFFICE — 1601 UNION BANK BLDG., PITTSBURGH 22, PA.

★ MANUFACTURING FACILITIES THROUGHOUT THE UNITED STATES

No. 5- side-opening . . .

★ *Hi-Voltage Type D Gang-Operated Disconnecting Switches are for substation work, primarily where hook-operated switches would be inaccessible. They are available in capacities from 400 to 1200 amperes, 7,500 to 161,000 volts.**

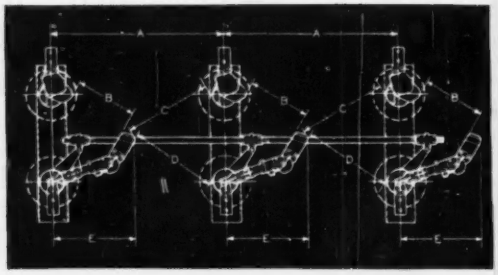
Certain operation anytime...under any conditions...even after years of standing idle is your guarantee with Hi-Voltage Switches. One of the chief features that assures this outstanding service is the blade-and-contact construction.

Endurance tests in the laboratory . . . totalling over 100,000 operations . . . have shown no appreciable wear of Hi-Voltage contacts. We have never received an order for replacement contact parts. They don't wear out . . . they don't overheat . . . they don't need adjustment . . . they don't need cleaning.

The contacts are line-type and are silver-nickel, welded to copper, combining low resistance with low friction. Stainless-steel springs maintain maximum conductivity. Operating effort is applied directly to the switch arm. The entire switch is engineered to eliminate failure and wear.

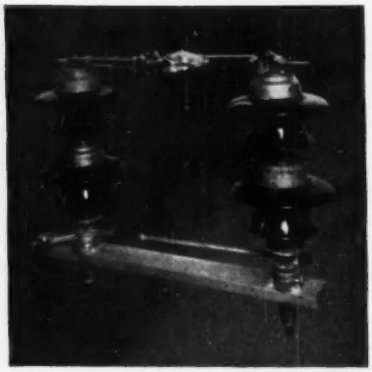
Ask your Joslyn Representative to show you more money-saving advantages of Hi-Voltage Switches.

**Type D switches are made for either right or left-hand opening and for upright, vertical or under-hung mounting.*



Open Position Clearances

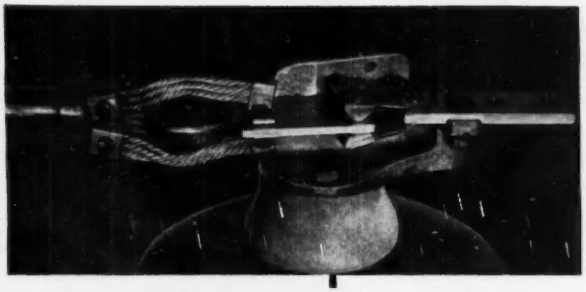
Voltage	A Minimum Phase Spacing	DIMENSIONS IN INCHES B	C	D	E
7,500	2'-6"	12	15	14	15
15,000	2'-6"	12	15	14	15
23,000	3'-0"	15	19	17	18
34,500	4'-0"	23	26	23	23
46,000	5'-0"	30	33	29	29
69,000	6'-0"	35	36	38	36
115,000	10'-0"	53	68	70	52
161,000	14'-0"	78	98	99	73



This center-break switch is used where phase spacing is unusually close or where clearances to bus work or the structure require a horizontal break switch.

HI-VOLTAGE

ype D gang-operated switches

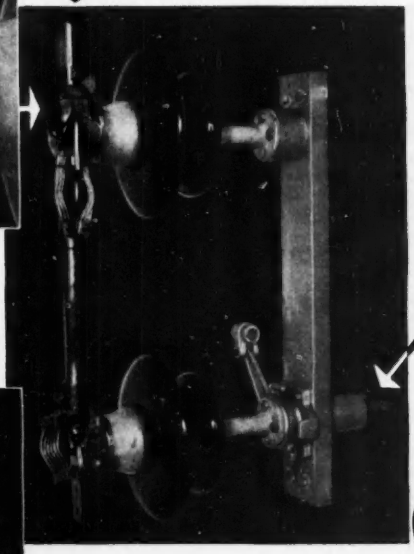


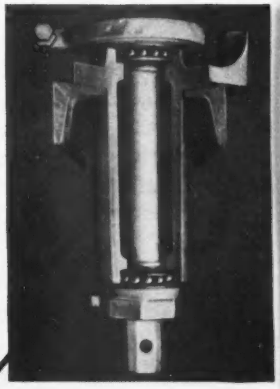
For description of this blade-and-contact construction, see opposite page.

Hi-Voltage SWITCHES ARE AVAILABLE

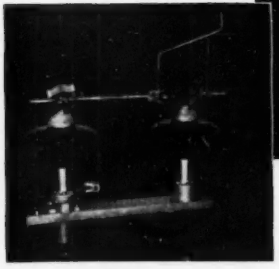
from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.

CONTACT HOUSING protects against sleet, dirt and arcing. Also, it acts as an ice breaker.





MAIN BEARING carrying rotating insulator is a forged steel spindle mounted in monel ball bearings and stainless steel races. Never requires lubrication.



ARCING HORNS are available for upright Type D Switches.

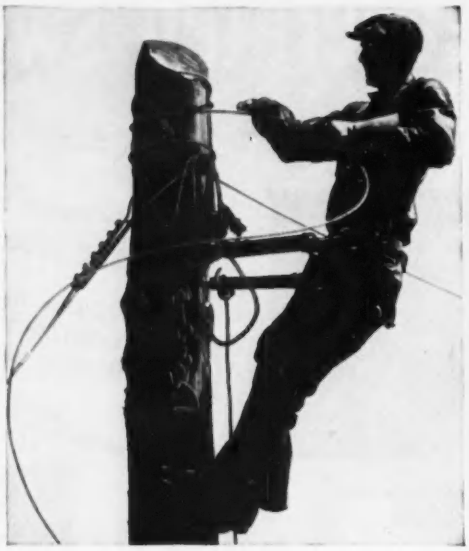
ALSO AVAILABLE!

- Grounding Switches
- Manual and Automatic Control Mechanisms
- Mechanical Interlocks
- Hi-Voltage Fuses
- Cross-arms and Mounting Frames
- And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO

Has What It Takes



For Guys, Messenger and Overhead Ground Wire

EXPERT linemen know, when they use *Crapo* Galvanized Steel Strand, that it will meet every requirement the job demands. For *Crapo* Galvanized Strand "has what it takes" — *strength, ruggedness, workability, long-life.*

These essential characteristics, combined with ever important ECONOMY, make *Crapo* Galvanized Strand first choice for guys, messenger and overhead ground wire. The superior tensile strength of the steel is utilized to fullest advantage in each size and grade. The heavy, ductile, tightly-adherent galvanized coating — applied by the famous *Crapo* Process — provides dependable protection for the steel, prolongs the expectant life of the strand.

The all 'round reliability and overall economy of *Crapo* Galvanized Strand are matters of record with leading strand users. Such records contain ample and significant proof of the long life and low annual cost of this strand in service.

Available for Prompt Delivery

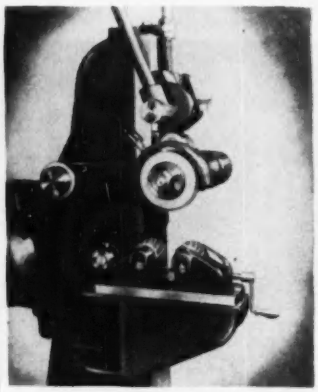
There is a size and grade of *Crapo* Galvanized Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write for further information!

INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

Crapo GALVANIZED STEEL STRAND

manufacturing, or processing plant in preventing wasted power, time, labor and money.
Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark, N. J.

•



Pipe De-Scaler

A new pipe and tube de-scaling and cleaning attachment for Steen cut-off machines has been announced.
Continental Machine Co. 1952 North Maud Ave, Chicago 14, Ill.

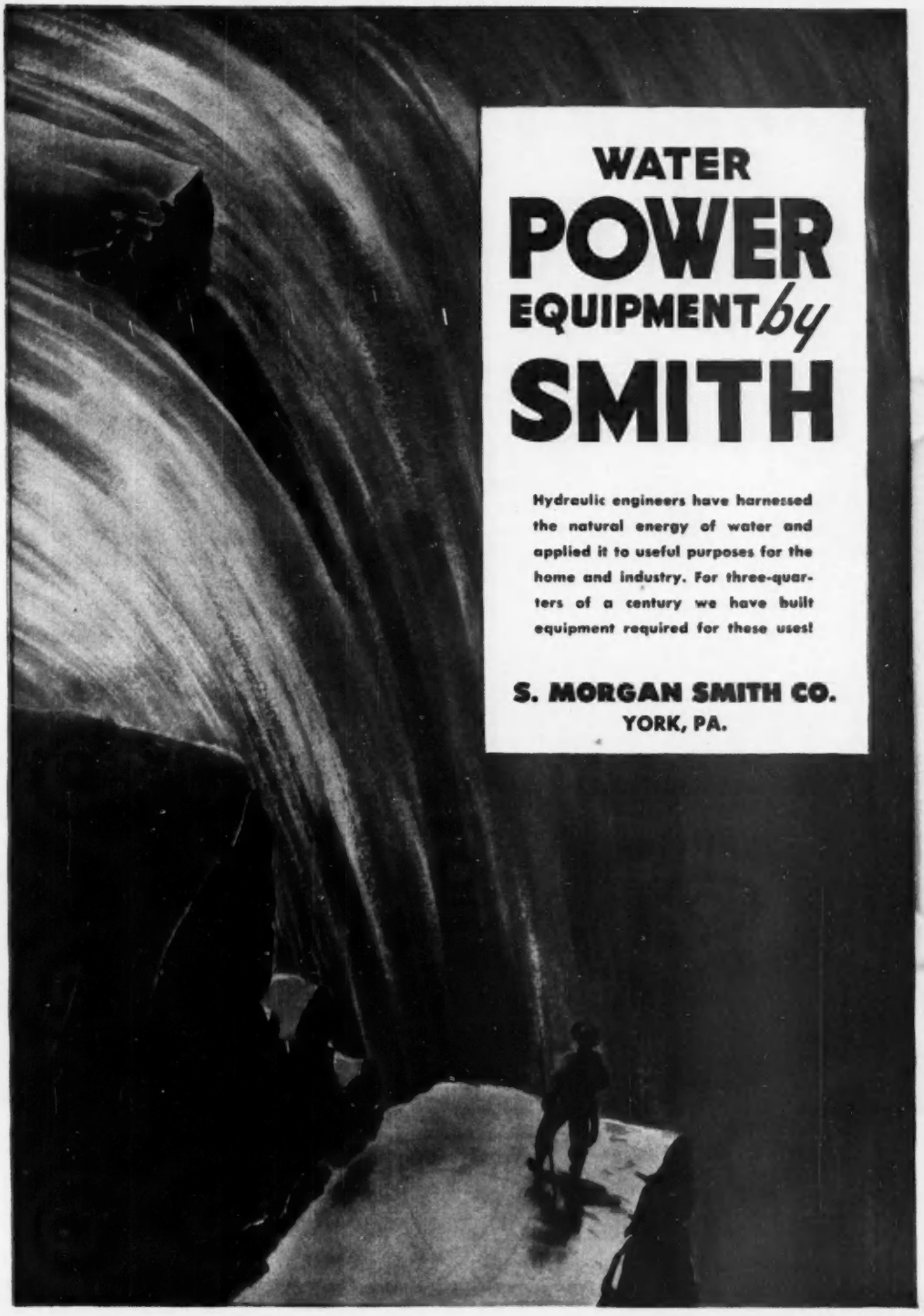
•

Car Icing Stacker

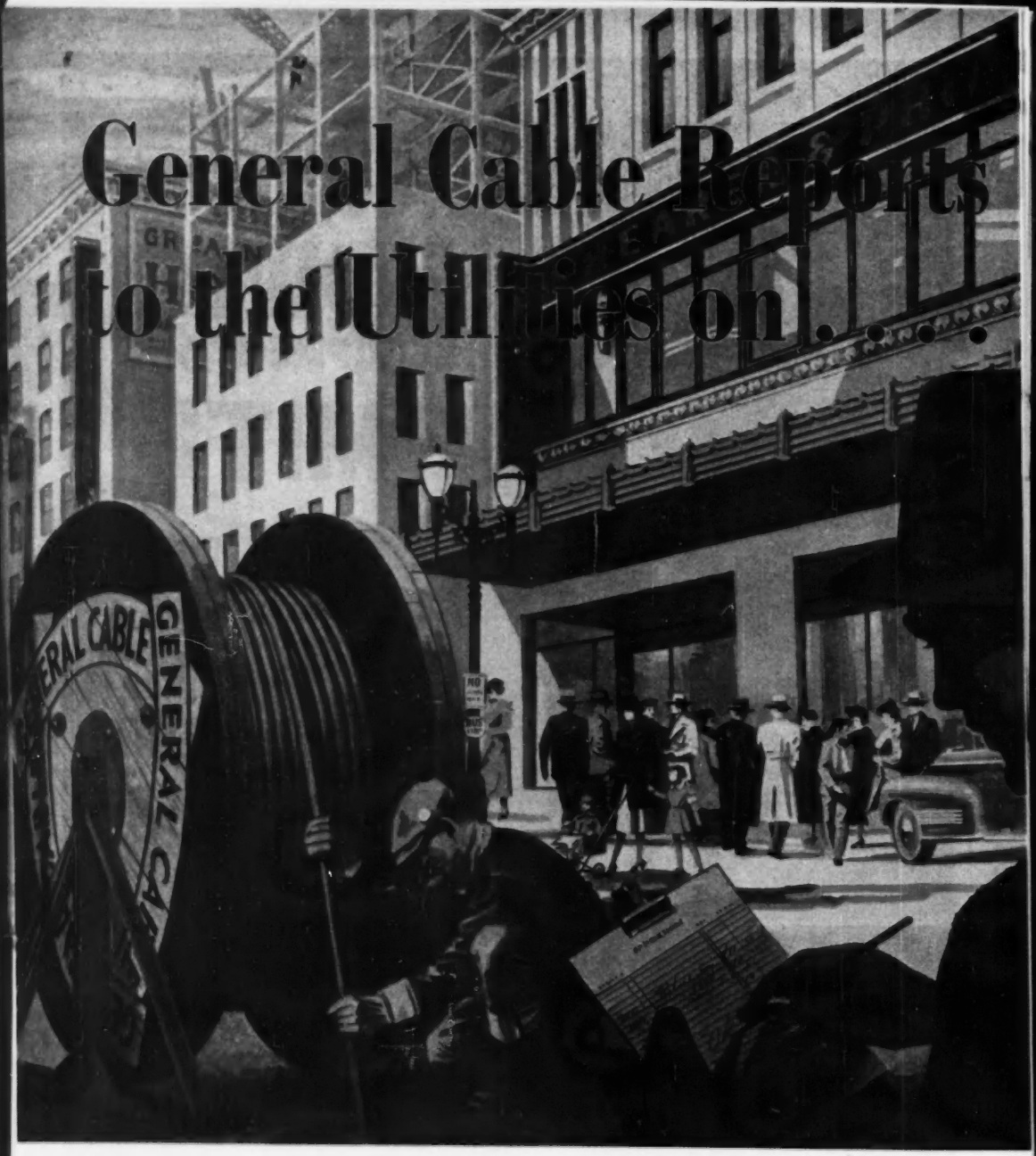
This new item eliminates the necessity of moving refrigerator cars to ice chutes for loading ice. Ice stacker can be mounted on the bed of any highway truck directly behind the cab.

Lifting the load of ice is accomplished by a hydraulic pump connected to a power takeoff. Stacker is

(*Continued on page* 202)


WATER
POWER
EQUIPMENT by
SMITH
Hydraulic engineers have harnessed the natural energy of water and applied it to useful purposes for the home and industry. For three-quarters of a century we have built equipment required for these uses!
S. MORGAN SMITH CO.
YORK, PA.

General Cable Reports to the Utilities on . . . .



GENERAL CABLE
GENERAL CABLE
GENERAL CABLE

PAPER CABLE MANUFACTURED AT BAYONNE, N. J.

PAPER CABLE

Regardless of the shortage of critical metals, Utility plans for power transmission, of necessity, must move ahead.

General Cable's long range program of stepping up its Paper Cable facilities is virtually complete. Substantial bottle-necks have been eliminated, and Equipment added at all three Paper Cable plants: Bayonne, N. J., St. Louis, Mo. and Emeryville, Calif.

Though present back-log is substantial, increased capacity enables us to review your needs with you and to give you confidence in the working-out of your increasing demands.

We would like to confer with customers now, on their future needs, on a practical "look-ahead" basis.

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.
SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

ST. LOUIS, MO. AND EMERYVILLE, CALIFORNIA

Top Brass Says I'M GUILTY

In a way that's correct. He was mighty careful about the kind of equipment he bought—*not* so careful about the kind of fire protection he gave it. When fire hit it was too late.

There's a moral to this: Your transformers, generators, switching equipment and other critical components can't be spared today. Give them the fire protection they deserve.

Here CARDOX experience can help you.

The *first* "CARDOX Low Pressure Carbon Dioxide System"* ever built went into a central station. Since then 14 of the nation's 25 largest utility companies have chosen CARDOX Systems to safeguard operations.

The performance record has been extraordinary! CARDOX CO_2, applied as easily in *tons* as in pounds, overwhelms big or little fires quickly and positively . . . reduces fire damage to a minimum . . . causes no extinguishment damage whatever.

CARDOX protection can help you conserve the equipment you'd be hard-pressed to replace. Let's get together. Write us, please.

*Covered by Patents Issued & Pending

CARDOX

ORIGINATOR OF Low Pressure CO_2

FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

Offices in Principal Cities

made to lift up to 2,000 or 5,000 lbs of ice, depending on the size desired. **Lewis-Shepard Products, Inc, 190 Walnut Street, Watertown 72, Mass.**

•

Vapo-Swat Insect Killer

A scientific, electronic instrument for complete elimination of flying and crawling insects has been developed recently. Called the Vapo-Swat, unit vaporizes lindane tablets which eliminate insects.

Vapo-Tab tablets give complete automatic protection of 15,000 cubic feet of area. Unit plugs into any electrical outlet.

Vapor Chemical Co, Rives Junction, Mich.

•

Plug-in Panelette

Plug-in panelettes are now available with either lugs or circuit breaker mains from 2 to 40 circuits for use on ac lighting and appliance circuit applications.

You c... with FARGO Automatic Line Splices

... because the Exclusive FARGO "One-Piece" Jaw Makes Them "the sure splice!"

FARGO

Ask your Line Material Field Engineer to give you complete details.

FARGO WIRE CONNECTOR, INC.
Manufactured by
LINE MATERIAL COMPANY

he's free of concern . . . his trucks won't burn

Going home . . . relaxing after a day of high-geared activity is no trouble for this trucker! His mind's at ease about fire . . . thanks to the safety given his trucks, cargoes, terminals and garages by efficient, quick-acting C-O-TWO Fire Protection Equipment.

You too, can have this same peace of mind . . . this same positive protection from costly fires by installing complete, approved C-O-TWO Fire Protection Equipment. For instance, with a C-O-TWO Automatic Fire Protection System in a trailer, you have a 24 hour a day automatic fire watchman . . . whether under way or parked. Heat detectors on the ceiling quickly actuate the system . . . then clean, dry, non-damaging, non-conducting carbon dioxide gas is flooded into every nook and corner, extinguishing the fire in seconds before it spreads and causes serious damage. After use, the carbon dioxide disappears without a trace . . . no water damage, no after fire mess.

C-O-TWO Portable Fire Extinguishers . . . either carbon dioxide type or dry chemical type . . . render fast, positive action for extinguishing fire during the incipient stage. C-O-TWO Portable Fire Extinguishers are designed to take abuse . . . rugged construction, no extra gadgets protruding or complicated operating parts . . . built to rigid specifications to assure you of lasting, efficient fire protection.

So, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today for complete free information . . . our experience is at your disposal.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

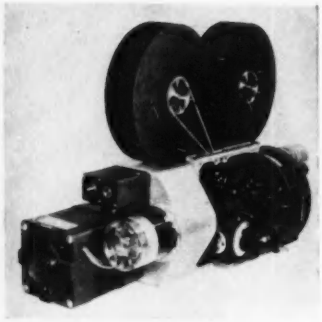
Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

Featured are thermal magnetic circuit breaker units, rated 15, 20, 30, 40 or 50 amp. Underwriters approved, panelettes are usable on single phase or three phase systems.
Square D Co, 6060 Rivard St, Detroit 11, Mich.

•

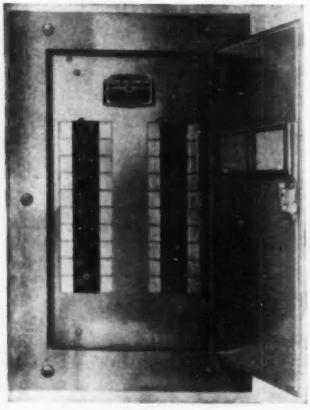


Synchronized Motion Picture Camera

Among the scientific and engineering applications for this synchronized motion picture camera system are: Data recording, ordnance evaluation, and most applications where two or more sources of information must be recorded at essentially the same time.

The manufacturer reports that there is no practical limit to the number of cameras that may be synchronized.
J. A. Maurer, Inc, 37-01 31 St, Long Island City 1, N. Y.

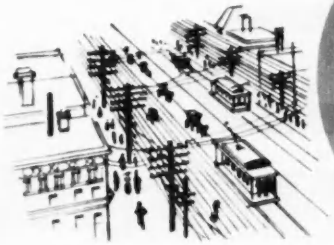
•

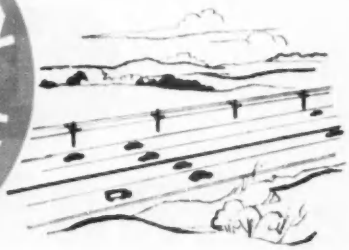


Simplified Lighting Panels

A new type of panel board that can be made up by the distributor has

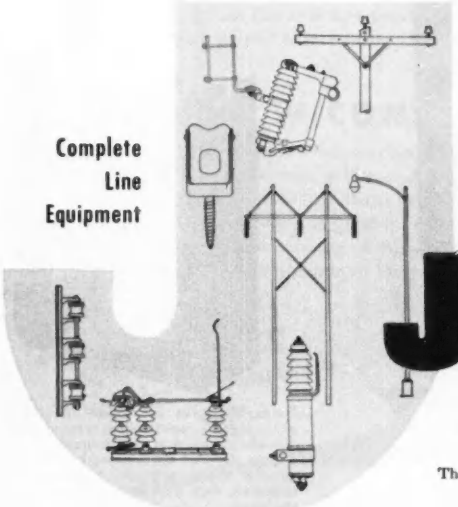
(*Continued on page* 209)





Joslyn has served the Power, Light and Communications Industries through 50 years of amazing development and growth, and today thousands of miles of overhead lines are supported by Joslyn products, which, through their sound design and high quality, represent a large factor in maintaining these essential services in continuous operation.

On the occasion of our 50th Anniversary may we express our avowed purpose of continuing to serve these great and strategic Industries by supplying the finest line components and equipment that can be produced with quality materials and the most modern techniques.



Complete
Line
Equipment

Joslyn

MFG. AND SUPPLY CO.

20 NORTH WACKER DRIVE • CHICAGO 6, ILL.

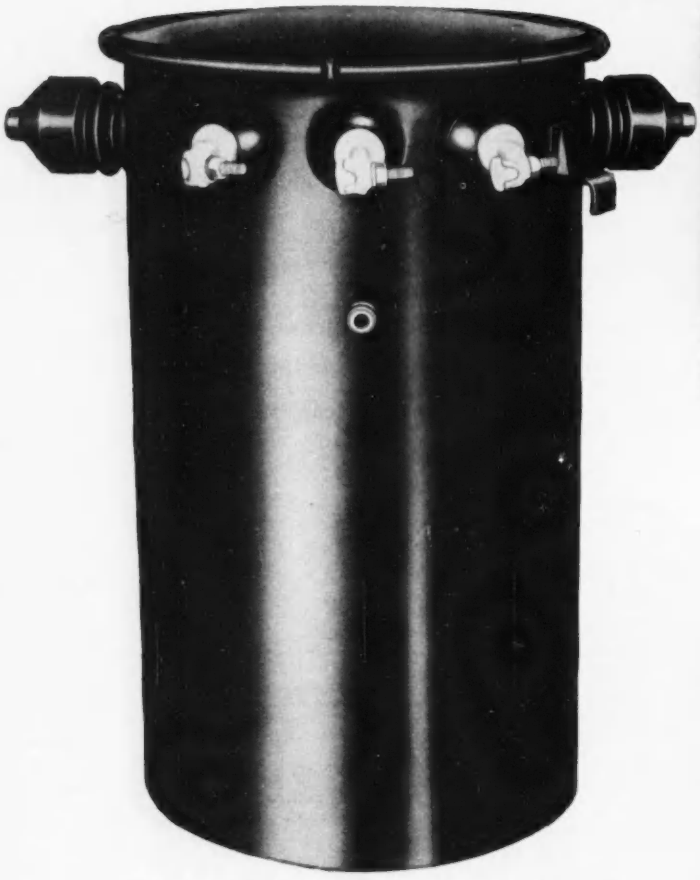
BRANCH OFFICES IN PRINCIPAL CITIES

The Joslyn Co. • The South East Joslyn Co. • Southern Joslyn Co.
Joslyn Southwest Co. • Joslyn Pacific Co.

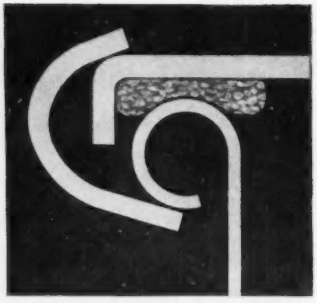
Wagner

Form W

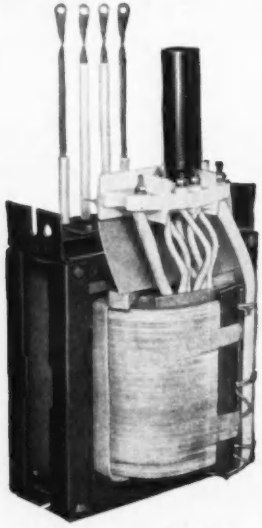
TRANSFORMERS - - -



Wagner Form W Transformers are exactly right for modern distribution systems. Their small size and light weight makes them easy to handle —to store—to mount on poles. They are available in ratings up to 100 kva, with protective devices to meet your particular needs. Why not investigate them today?



The SHUR-SEAL Clamping Ring, of V-shaped cross section, seals the cover to the tank with a Corprene gasket. A single corrosion-resistant bolt securely locks the cover in place.



Form W Cores are made of oriented grain steel, properly heat treated to obtain the lowest practical magnetic losses. The preformed core, assembled in rectangular shape, provides a path for the magnetic flux parallel to the grain of the steel.

give *TRIPLE* protection against failure

1 SHUR-SEAL COVER

Wagner distribution transformers are provided with covers locked securely to the tank with the exclusive Wagner SHUR-SEAL Clamping Ring. This method of fastening the cover provides true sealed tank construction. "Breathing" is completely prevented, and no loss of oil can occur during shipment or handling. The SHUR-SEAL Clamping Ring maintains equal pressure all around the cover—yet permits easy accessibility by loosening a single corrosion-resistant bolt.

2 INHIBITED OIL

Wagner distribution transformers are filled with inhibited oil, thus reducing oxidation to a minimum and retarding the formation of acids and sludge which ultimately cause its deterioration. This inhibited oil, in combination with the sealed tank construction provided by the Wagner SHUR-SEAL cover clamp, adds years to the servicefree life of Wagner distribution transformers.

3 FORM W CONSTRUCTION

Wagner Form W Construction, with preformed cores of cold rolled, oriented grain steel, permits a liberal design in small size, light weight transformers that give excellent electrical performance. Core and copper losses are low . . . voltage regulation is good . . . exciting current is extremely low . . . and short time overload capacity is high. Form W Transformers are built the Wagner way—to pay dividends in longer service life.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION

6456 PLYMOUTH AVE. • ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

Sangamo J Meters

performance-proved by 12 years of service

In the consumer's mind the meter is the instrument which represents his dealings with the power company. In the interest of good public relations, the meter must instill confidence by its accurate performance . . . it must operate quietly and without trouble . . . and be thoroughly dependable.

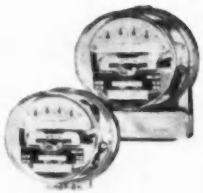
Millions of Sangamo J Meters, many in use since 1940, give conclusive proof that they stay accurate. An eight year test record, by one large company, shows a change in average accuracy of only 0.03%. Such sustained accuracy is due in part to the modern noiseless, oilless, non-corrosive bearing system and the rigid dovetailing of elements in J Meters.

Troublefree operation is inherent in their construction. Built for outdoor installation, they are corrosion-resistant and are fully temperature compensated.

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.



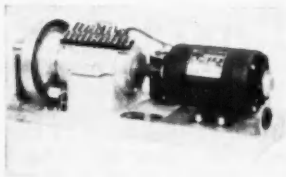
been announced by Bulldog Electric.

Panel consists of a basic device, cabinet, front and interior which contains 4 or 6 Pushmatic breakers. Panels are available in up to 42 circuits for either three-wire single phase or four-wire three phase systems.

Five basic panelboards cover hundreds of applications and eliminate much delay in factory ordering.

Bulldog Electric Products Co, Detroit 32, Mich.

•



Shaft Position Indicator

The new ERA shaft monitor locator unit utilizes a simple magnetic recording mechanism to detect the angular position of a rotating shaft.

Electronic circuits incorporated in the associated converter unit accomplish necessary control functions and convert the position indication to digitial form.

Engineering Research Associates, Inc, 1902 W Minnehaha Ave, St. Paul W4, Minnesota.

•

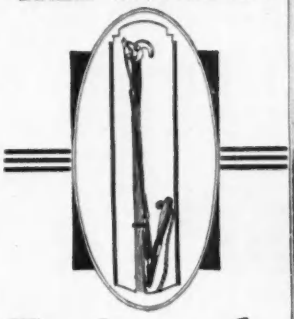
Heavy Duty D. C. Welder

Designed for all industrial uses where dc welding is required is this new heavy duty dc welding machine.

Company claims it to be free of stack failure, as high velocity downdraft of cool air is directed over rectifer stacks before being passed through other parts of the machine.

STILL TRUE TODAY!

BARTLETT TREE TRIMMERS



Endorsed *by the Best!*

WHEN companies that make a business of tree trimming use Bartlett equipment, you may be sure that they have found it to be the best. And Bartlett equipment, besides being used by these companies, is standard line equipment on most of the central stations throughout the country.

Trimming around hot wires with a Bartlett is safe—the 30-inch Bakelite insulator is tested to 105,000 volts, the cutting head easily nips off branches up to 1¼ in. diameter. For larger branches the Bartlett pole saw is the thing. Bartlett Trimmers come with airplane spruce handles, eight to sixteen feet long, with extra lengths easily attachable and locked with aluminum sleeves.

Write for booklets and complete information.

Here are some of the users of BARTLETT TREE TRIMMING TOOLS.

On Exhibit at N.E.L.A. Convention, Atlantic City

BARTLETT MFG. CO.

23 years ago we used the above advertisement . . . Today, Bartlett tree trimming equipment, because it serves best, and lasts longer, is *still endorsed* by 24 of these same companies in addition to many more satisfied users.

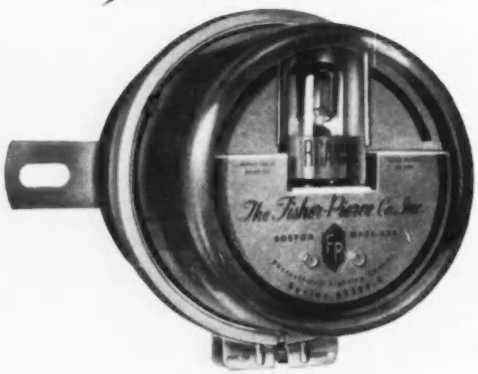
Write for our catalog today—

BARTLETT MFG. CO.

TRADE COMPOUND LEVER MARK

3003 East Grand Blvd. • Detroit 2, Michigan

Improved....



Series 63300 B

FISHER - PIERCE

PHOTOELECTRIC CONTROL

FOR STREET LIGHTING

This new Fisher-Pierce Control is the result of long experience in design and manufacture, combined with practical experience of more than 600 electric utilities in more than 20,000 installations.

The new 63300 B Control is mechanically and electrically interchangeable with existing controls. The same dependable Fisher-Pierce circuit, consistently giving tube life of more than 20,000 hours, has been retained. Improved spacing and insulation provides increased protection against lightning damage . . . up to 2500 volts rms Hipot. Mechanical design has been altered to provide maximum simplicity for greater economy of servicing.

The FISHER - PIERCE Co., Inc.

82 PEARL STREET, SO. BRAINTREE, BOSTON 85, MASS.

Other features are case-diameter fan and "wind tunnel" design which assures efficient air flow over all energized parts.

Machine is available in 200, 300 and 400 amp ratings.

A. O. Smith Corp, Milwaukee, Wis.

•

Electrical Steel

Intended for use in transformers and reactors which operate at 400 cycles, Trans-Cor T-O-S, is reported capable of operating at very high inductions.

Supplied in 4-mil thicknesses this material is treated on both sides to insure low interlaminar energy losses.

Minimum permeability at 18 kilogausses is reported as 1800. It has a density of 7.65 grams per cu cm and a volume resistivity of 282 ohms/mil ft.

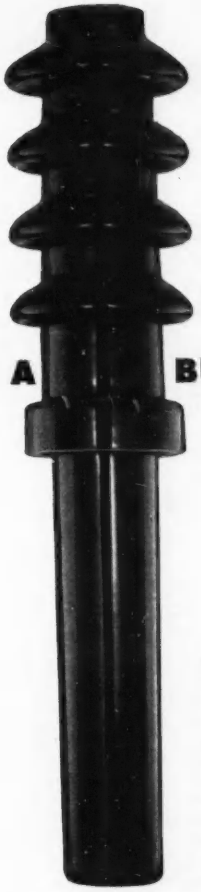
Armco Steel Corp, Middletown, Ohio

MORE NEW PRODUCTS

about which you should know

Westinghouse Electric Corp, Pittsburgh 30, Pa. announces new **heavy-duty Type M dc contactors** for steel mill and other heavy-duty industrial applications. Contacts feature self-cleaning, knife-edge bearings that are not affected by dust and new-type arc box for faster arc interruption. Available in NEMA ratings from 25 to 2,500 amps. . . . Ideal Industries Inc, Sycamore, Ill., has developed **a continuity tester** designed to determine continuity of circuits and identify wires between terminals or in multi-wire cable such as found in switchboards.

Hutchins Electric Co, Inc, of Ridgeway, Pa. announces the development of a **unique winding arrangement** for single phase motors which reduces total copper requirements about 25 per cent. Winding is large diameter wire which minimizes possibility of burnouts during starting. . . . Indamer Corp, 11 W 42 St, New York 18 offers a new **isometric-dimetric drafting machine** that enables rapid and precise rendering of isometric and dimetric projections. No previous isometric experience is necessary for draftsmen to operate the machine.



THIS IS A BUSHING PORCELAIN

Nothing unusual about it, nor complicated, nor difficult from a porcelain-maker's standpoint . . .

. . . Except for some "special" considerations. A smaller-than-usual porcelain bushing could contribute substantially to economy in the complete assembly . . . *if* the porcelain bushing could withstand some rather sharp mechanical impacts encountered in service . . . *if* the bushing could be mounted with a lead alloy instead of customary cement . . . and *if* the electrical reliability of the porcelain were certain.

That sounds easy. And it is . . . for Lapp. Yet Lapp porcelain was one of very few found which met this set of requirements. This piece in Lapp porcelain developed almost twice the strength of that of some other porcelains tested. It won't crack under the strain of lead mounting. And, like every piece of Lapp porcelain, each unit gets a high-safety-factor electrical test before shipment.

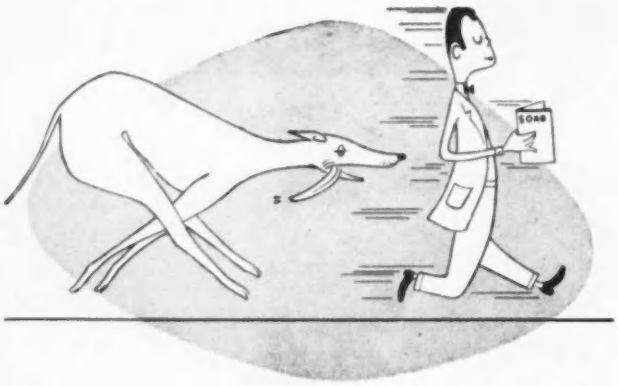
The manufacturer who uses this Lapp porcelain bushing in his product knows that he is offering extra value to his customers when he says *"Porcelain by Lapp."* Also he realizes production economies resulting from elimination of factory troubles, assurance of freedom from rejects, close adherence to mechanical specifications, and elimination of need for testing these parts. So, although he pays somewhat more per piece for porcelain of Lapp quality than he would for the cheapest porcelain he could buy, he finds he is getting a bargain in all-over cost, performance, and prestige.

Do you look for the name on the *porcelain* in equipment used on your system? When you find Lapp porcelain, you'll know that the manufacturer of that equipment is willing to give you "something extra" as a guarantee of dependable performance.

For . . . *you can buy cheaper porcelain . . . you can't buy better porcelain* . . . than Lapp.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



Lo, the poor greyhound

With all his reputation for speed, he can't hold a candle to Sorg when it comes to meeting a rush-rush deadline. Sorg, for over thirty years specialists in all types of financial, corporate and legal printing, is uniquely geared to combine speed with unerring accuracy.

We handle design, specification of format, composition, printing, binding and mailing all under one roof . . . we're available round the clock . . . we offer the use of procedure manuals, conference rooms, transportation facilities. But most important of all, we maintain a standard of *quality* consistent with the prestige of our clients.

CONFIDENTIAL SERVICE SINCE 1920

SERVICE QUALITY RELIABILITY

SORG

PRINTING CO., Inc.

80 SOUTH ST., NEW YORK 38, N.Y.

Financial, Legal, Corporate Printers

Chicago Associate
McCORMICK and HENDERSON, Inc.

London Associate
The LEAGRAVE PRESS, Ltd.

WHAT THEY'RE SAYING

At Industry Meetings

Meeting the Challenge of 1952

Philip Sporn, *president, American Gas and Electric Co.*

The two factors utility management will be most concerned with in 1952 are the dynamic growth pattern of the industry and rising costs.

The power industry has been running some 12% ahead on demand and 13% ahead on actual output as compared to a year ago.

AG&E expects an increase of 374 mw in system demand in 1952. Reserve will be small in 1952, but 1952 should be the last year of tightness.

Steel should ease up by mid-52, but aluminum and especially copper will be in short supply. These items will in all probability increase in price. Unless costs level out, more AG&E subsidiaries will be forced to ask for rate increases.

A total of 1,100,000 kw of generating capacity are simultaneously being built on the AG&E system. This is the largest block of generating capacity scheduled for completion in the same period by any power system in the U. S. outside of TVA.

Construction and Controls

Bennett S. Chapple, Jr, *assistant executive president United States Steel Co before the Real Estate Board of Kansas City*

Government controls are administered in a state of confusion because they inherently and inevitable create confusion. Controls are incompatible with our enterprise system.

There are three fundamental points to a program of defending our country and improving our economy:

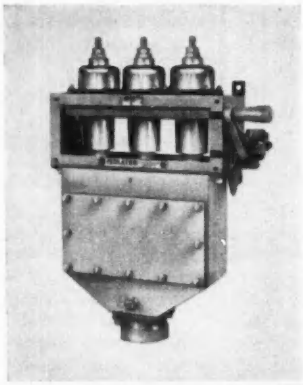
1. Maintain production at its highest level, and that this production be directly related to the needs of the entire economy both civilian and military.

2. Direct defense requirements must be handled regardless of the effect on non-defense requirements.

3. All inflation must be eliminated from future stated requirements of steel.

Specifically, a balance must be made between CMP allotment tickets and the authorized production directives.

MINIMUM in Space and Materials —MAXIMUM in Usefulness and Protection



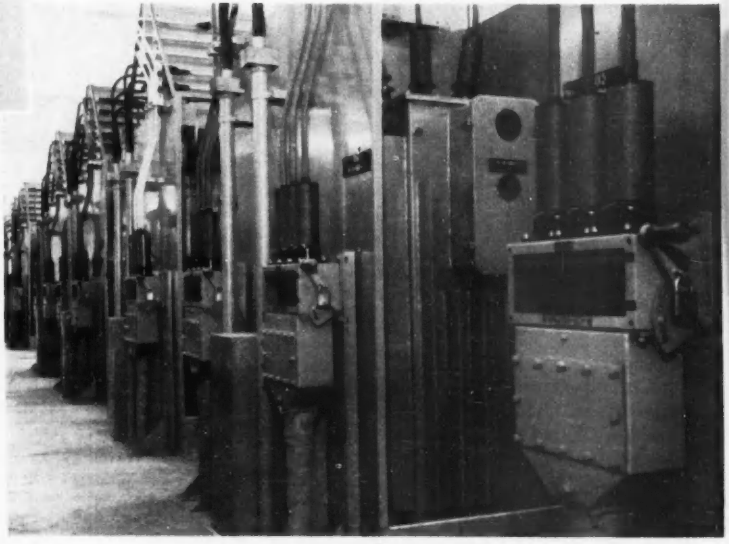
3. P.S.T. 400 ampere, 5000 volt, Cable ISOLATOR.

The Three E Cable ISOLATOR is a compactly built device incorporating cable terminating and disconnecting features.

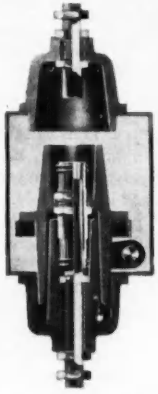
Instead of the customary cable terminal plus a group operated disconnect with barriers and a set of connecting jumpers, this one piece of equipment takes care of all requirements.

Savings in space and materials result from the use of this unique device. Furthermore, its current paths are enclosed in insulation.

The accompanying photograph shows how the Cleveland Electric Illuminating Company has used Cable ISOLATORS to good advantage.



Here in one of their large substations, terminating and disconnecting facilities are efficiently provided for twelve 4600 volt three phase outgoing cables, connecting to voltage regulators and other circuit apparatus.



Cross sectional view of 400 ampere 5000 volt ISOLATOR in open position.

You, too, will find that "YOU CAN DO IT BETTER WITH AN ISOLATOR."

This Utility has many other ISOLATORS and Cable ISOLATORS in service.

You Can Do It Better With An ISOLATOR

Ask for our bulletin 140 and learn of the many advantages you can receive by using the superior disconnect.

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

produced · treated · sold by

J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

Double-Life *Western Larch Poles*

J N *J. Neils Lumber Company*

Pole Division: LIBBY, MONTANA

Up to now, too many tickets have been cashed far in advance of actual needs and the steel temporarily placed in inventory.

This year ingot production will be about 105 million tons if enough scrap is gotten.

The three dangers which threaten our future progress are the danger of World War III, inflation and socialism.

The Changing South

Charles Sawyer, *Secretary of Commerce, at meeting of Third Annual Atlanta Retailing Clinic, Atlanta, Ga.*

The South had only 11% of the nation's manufacturing wage earner employment at the end of World War II and ranked in fourth place. It is now surpassed by only the Central and Middle East regions. In 1947, 48% of the textile industry employment, 45% of the lumber industry employment and 60% of the tobacco products industry were in the South.

Paralleling this, is the rapid expansion in the output of fuels and other minerals. The same is true for agriculture.

The South has everything needed for a balanced and growing economy.

Industry and the Atom

T. Keith Glennan, *commissioner, Atomic Energy Commission before meeting of the ASME at Atlantic City, N. J.*

The lack of normal profits, absence of patent protection, unusual expense in terms of manpower, complex security regulations, unusual health standards and a fair supply of red tape have kept private enterprise from going into the atom business whole heartedly.

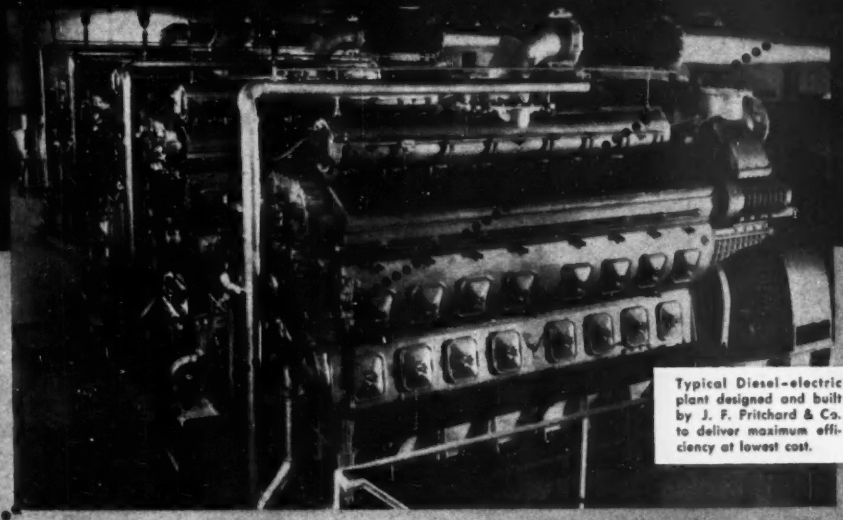
On the other hand, prestige, improvement in technical resources of its staff and the idea of getting in on the ground floor are the main reasons for those already in the atom business to stay in it.

One bottleneck in the AEC is the lack of trained personnel, especially graduate engineers.

The development of atomic power for electric generation is being studied by four groups of chemical and utility companies.

Engineers and management should give some thought to turning to the atom business. This is the only way government monopoly will be broken.

Need Extra Power Generating Capacity?

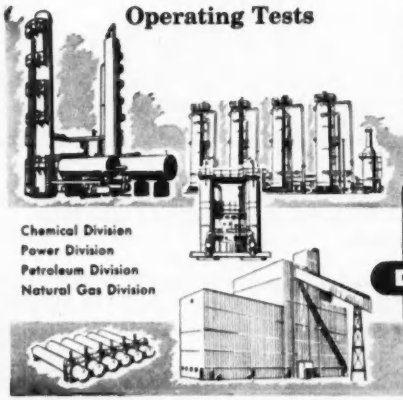


Typical Diesel-electric plant designed and built by J. F. Pritchard & Co. to deliver maximum efficiency at lowest cost.

Develop It Quickly, Easily, Profitably With a Pritchard Diesel-Electric Plant!

Pritchard's Single Responsibility Contract Includes

Design
Engineering
Purchasing
Field Construction
Guarantees
Operating Tests



Chemical Division
Power Division
Petroleum Division
Natural Gas Division

If you are a forward-looking industrialist or utility executive seeking to retain essential profit margins in the face of rising labor and materials expense, you'll undoubtedly recognize an adequate source of power as essential for improving plant efficiency and maintaining a profitable level of operation.

For more than a quarter-century, J. F. Pritchard & Company has rendered valued service to utility and industrial clients in this country and abroad concerning every variety of problem related to electric power generation.

You, too, are invited to rely upon the experienced engineering counsel of Pritchard's Power Division to make your next power installation *outstanding* in proved design, operating practice, equipment and construction. Write for complete information.

NATIONAL CONSTRUCTORS ASSOCIATION MEMBER

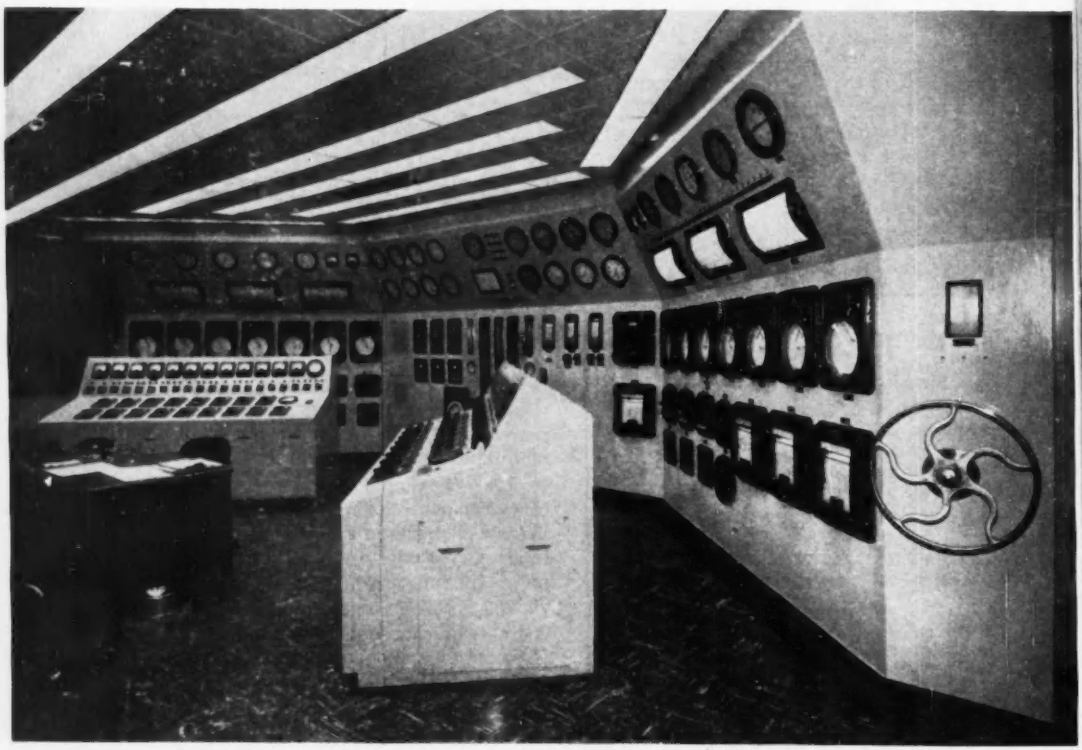
J.F. Pritchard & Co.

DESIGN • ENGINEERING • CONSTRUCTION

Dept. No. 194 — 908 Grand Ave., Kansas City 6, Mo.

District Offices: CHICAGO • HOUSTON • NEW YORK • PITTSBURGH
TULSA • ST. LOUIS • Representatives in Principal Cities from Coast to Coast

What's YOUR Fuel-dollar



This Centralized Boiler Control Room insures high efficiency in the use of of Fuel-dollars at the Mustang Station of Oklahoma Gas and Electric Company. It includes Bailey Meter Combustion Control, Bailey Three-Element Feed Water Control, Bailey Steam Temperature Control, and Bailey Feed Water Pump Recirculating Control for two gas-fired boilers.

Controls for Steam Plants

COMBUSTION • PRESSURE
FEED WATER • LIQUID LEVEL
TEMPERATURE • FEED PUMPS

Efficiency ?

A dollar's worth of fuel has the *same potential* energy, no matter who's boiler it fires. But how much of the energy actually gets converted to a usable form depends on how you operate your boiler.

That's where Bailey Controls can help. And, here's why, we believe, you'll get better fuel-dollar efficiency with Bailey:

1. **Complete Range of Equipment—fully co-ordinated.** You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, just because he has a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.

2. **Engineering Service—backed by experience.** No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement and automatic control.

3. **Direct Sales-Service—conveniently located near you.** Bailey Meter Company's sales-service engineers are located in more industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

For better fuel-dollar efficiency—for more power per fuel-dollar, less outage and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey Engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More power to you!"

A-199

BAILEY METER COMPANY

1060 IVANHOE ROAD • CLEVELAND 10, OHIO

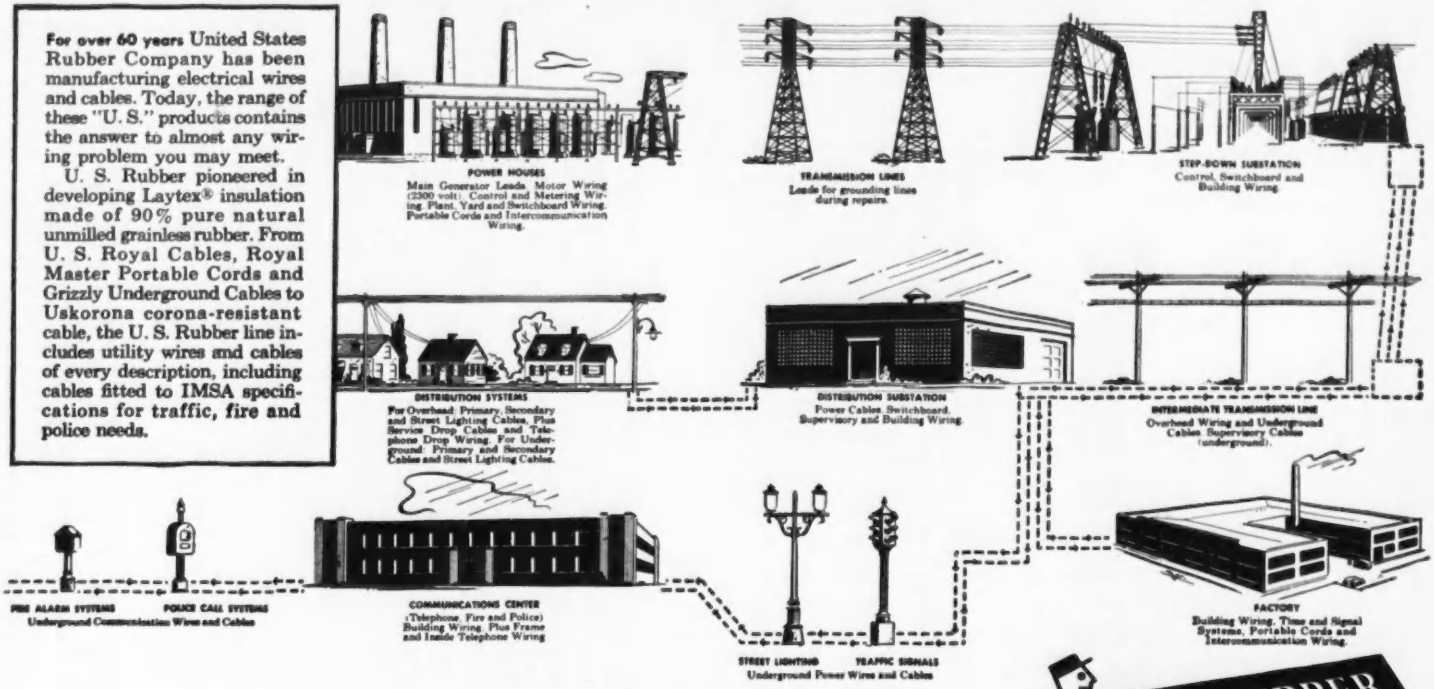
BAILEY METER COMPANY, LIMITED • MONTREAL, CANADA

You can solve any power puzzle

with U. S. Rubber Electrical Wires and Cables

For over 60 years United States Rubber Company has been manufacturing electrical wires and cables. Today, the range of these "U. S." products contains the answer to almost any wiring problem you may meet.

U. S. Rubber pioneered in developing Laytex® insulation made of 90% pure natural unmilled grainless rubber. From U. S. Royal Cables, Royal Master Portable Cords and Grizzly Underground Cables to Uskorona corona-resistant cable, the U. S. Rubber line includes utility wires and cables of every description, including cables fitted to IMSA specifications for traffic, fire and police needs.


POWER HOUSES
Main Generator Leads, Motor Wiring (2300 volt), Control and Metering Wiring, Plant, Yard and Switchboard Wiring, Portable Cords and Intercommunication Wiring.
TRANSMISSION LINES
Leads for grounding lines during repairs.
STEP-DOWN SUBSTATION
Control, Switchboard and Building Wiring.
DISTRIBUTION SYSTEMS
For Overhead Primary, Secondary and Street Lighting Cables, Plus Service Drop Cables and Telephone Drop Wiring. For Underground: Primary and Secondary Cables and Street Lighting Cables.
DISTRIBUTION SUBSTATION
Power Cables, Switchboard, Supervisory and Building Wiring.
INTERMEDIATE TRANSMISSION LINE
Overhead Wiring and Underground Cables, Supervisory Cables (underground).
FIRE ALARM SYSTEMS
POLICE CALL SYSTEMS
Underground Communication Wires and Cables
COMMUNICATIONS CENTER
(Telephone, Fire and Police) Building Wiring, Plus Frame and Inside Telephone Wiring
STREET LIGHTING
TRAFFIC SIGNALS
Underground Power Wires and Cables
FACTORY
Building Wiring, Time and Signal Systems, Portable Cords and Intercommunication Wiring.

UNITED STATES RUBBER COMPANY

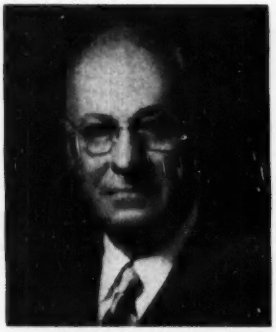
Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

U.S.RUBBER
SERVING THROUGH SCIENCE

NEWS ABOUT PEOPLE

Garman Is Named to New Post

Los Angeles Water & Power veteran appointed assistant general manager and chief engineer. Peterson elevated



C. P. GARMAN

W. S. PETERSON

Charles P. Garman, chief electrical engineer of the Los Angeles Department of Water & Power, has been appointed to the newly created post of assistant general manager and chief engineer. In his new position, he will assist the general manager, S. B. Morris, in the overall administration of the department and will act as general manager in his absence.

Garman's former work now will be handled by W. S. Peterson, with the title chief electrical engineer and assistant manager, and George C. Sopp as part of his new duties as assistant manager in charge of the joint water and power system.

Started as Draftsman . . . In 1920 Garman joined the department as a draftsman. He was named engineer of design and construction in 1943 and the following year was advanced to the position of assistant chief electrical engineer. In 1945 he was appointed chief electrical engineer and a deputy general manager of the Los Angeles municipal system.

Starting with the department in 1922 as a draftsman, Peterson is best known for his work in designing the 287.5-kv Boulder Dam transmission line circuits. From 1926 until the third circuit was completed in 1940, he was engaged in technical research on high voltage, conductor vibration, and line stability problems, as well as general transmission design. During World War II he was power consultant to the War Production Board. In December, 1943, Peterson was appointed to head the design and construction division and since 1945 has been assistant chief electrical engineer.

Sopp has served as head of the meter and service unit of the water distribution division.

In another appointment, T. M. Blakeslee was named assistant electrical engineer in charge of operations.

•

GE Advances Crawford, Herskind and Kettenring

S. Norman Crawford has been appointed designing engineer for power electronic equipment in General Electric Co's Tube Department.

In other appointments, C. Curtis Herskind has been made section engineer to direct development of power electronic equipment and components and Walter R. Kettenring a section engineer to direct product design of power electronic equipment.

They will make their headquarters at the GE industrial and transmitting tube plant at Schenectady, N. Y.

Crawford, a section engineer, started with GE on the company's test engineering program in 1941 and a year later joined the power rectifier section of the Apparatus Department at Schenectady as a design engineer. He became a section engineer in the power electronics division of the Electronics Department in 1945.

Herskind began with GE in 1925 at Schenectady as a test engineer. Five years later, after completing the company's advanced engineering program, he transferred to the power rectifier division of the Apparatus Department as an engineer, and completed various assignments in power rectifier and power electronics operations until his present appointment.

Kettenring joined GE in 1942 as a test engineer and since 1944 he has had engineering assignments in power rectifier and power electronics operations.

•

Brewer-Titchener Corp Elects Greene President

James H. Greene, vice president of Brewer-Titchener Corp, Cortland, N. Y., has been elected president.

In his new position, Greene will direct the 130-year-old firm's manufacturing operations which are carried on in two Cortland plants, two Binghamton, N. Y., plants, and a plant at New Milford, Pa.

J. H. GREENE

Greene joined Brewer-Titchener in 1919 and was made general manager of the company's Cortland Forging Division in 1930. In 1949 he was made a vice president, serving until his new appointment.

•

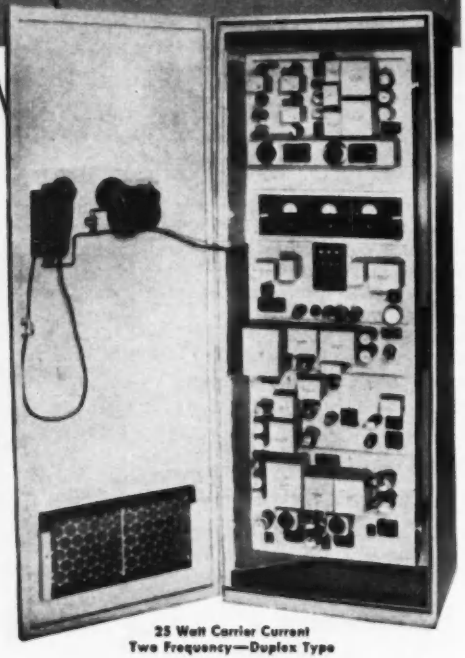
W. J. Gillespie, assistant district manager of the Bluefield (Va.) district of Appalachian Electric Power Co since 1948, has been promoted to district manager. Gillespie, who joined Ap-

ENGINEERS CONTROL CARRIER

Control Carrier features superior audio characteristics:

1. Better voice quality
2. Clearer tone
3. Very small tonal change

TEST FACT: Only 1½ decibel variation over 300-3000 c.p.s. voice range with 40 db circuit attenuation



25 Watt Carrier Current
Two Frequency—Duplex Type

Plus...
these added advantages:

1. Push-to-talk or voice operated units interchangeable.
2. Continuously variable frequency range from 50-150 kc. Other ranges on request.
3. Automatic modulation control prevents over-modulation.
4. Swinging panel construction for ease of maintenance.

APPLICATIONS:

- Supervisory Control
- Telemetering
- Communication

THE BETTER THE AUDIO CHARACTERISTICS the greater degree of clarity with consequent less error. Control Carrier is preferred by utility engineers because orders are transmitted with greater accuracy. Wherever the going is rough and reliable communication is important—you can count on Control.

Write . . . for complete information.

CONTROL CORPORATION
719 CENTRAL AVE. N.E. MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

palachian in 1937, was rural supervisor for the utility at Pulaski (Va.) before he was transferred to Bluefield four years ago.

•

Bullwinkle Named VP by Texas Utilities Co

Texas Utilities Co has announced the election of Richard Bullwinkle as vice president and John Hume as secretary and assistant treasurer.

Bullwinkle has been secretary and assistant treasurer of the company since its organization in 1945. Prior to this he was with Dallas Power & Light Co since 1933.

RICHARD BULLWINKLE

Hume, who succeeds Bullwinkle as secretary and assistant treasurer, has been handling special assignments in the executive department of Texas Electric Service Co. He joined Texas Electric in 1932 after working with General Electric Co. During World War II he served with the Army Corps of Engineers and upon his return to the utilty he assumed duties in the executive department.

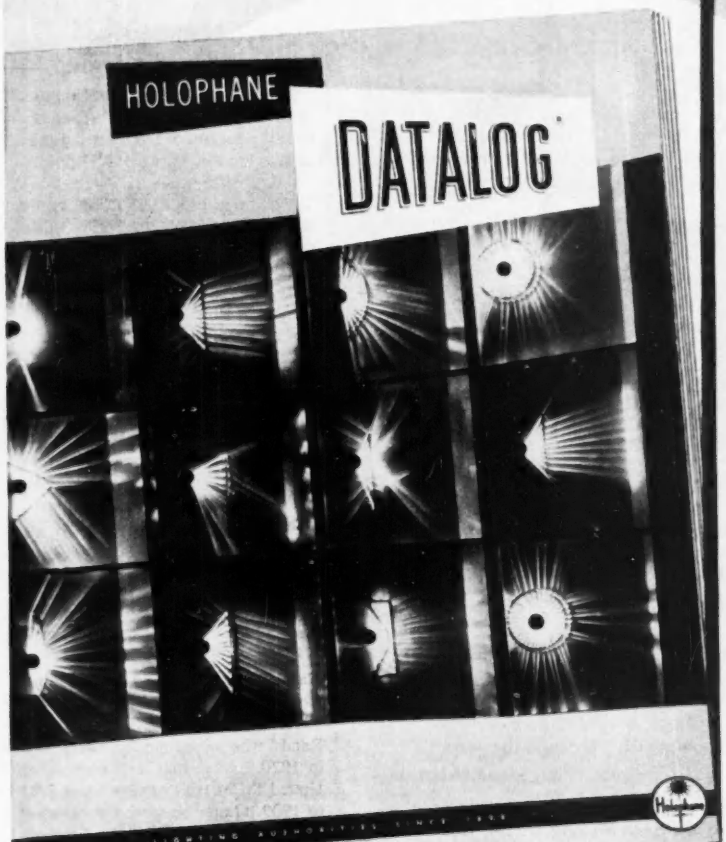
Dallas Power & Light and Texas Electric are operating utility subsidiaries of Texas Utilities.

•

C. H. Commons, Jr, has joined Illinois Electric Porcelain Co as manufacturing manager. He will be responsible for all phases of manufacturing and production in the Illinois plant. Previously Commons was director of ceramic research with the Locke Division of General Electric Co, Baltimore, Md.

Benjamin W. Kerr, president and one of the principal founders of the Railway & Industrial Engineering Co, has retired. He was made president of the company at the close of World War I

YOUR COPY of this Engineering-Data Catalog IS READY NOW!



A Complete GUIDE containing PRODUCT INFORMATION especially compiled for:

Architects
Engineers
Consultants
Draftsmen
Plant Executives
Electrical Contractors
Superintendents
Work Managers
Interior Decorators...
And all other people responsible for installation of proper COMMERCIAL, INSTITUTIONAL, INDUSTRIAL or OUTDOOR LIGHTING.

64 PAGES OF PERTINENT INFORMATION . . . Containing many illustrations of Holophane products . . . cross-sectional drawings . . . candlepower distribution curves . . . detailed information on a total of 270 lighting units . . . Description, performance, application and dimensional data are given on equipment . . . This book introduces the new Prismatic Control Board in the Light and Vision Institute, as well as many other new developments of Holophane research.

Please attach coupon to your firm letterhead.

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N. Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

HOLOPHANE COMPANY, INC. E-5
342 Madison Avenue, New York 17, N. Y.

Please send your new DATALOG, without charge to

FIRM NAME_____

ADDRESS_____

INDIVIDUAL_____

"Why doesn't our car stand up like that **KOPPERS POLE?** They're both the same age!"

● Koppers Poles do "age gracefully." Through the years, these durable poles *retain* their strength . . . *stay* sound and serviceable.

Utility companies can always count on long, trouble-free service from Koppers Poles—the kind of service that makes line operation easier, better, more economical.

Specify Koppers Full-Length Pressure-Creosoted Poles. You'll get appreciable savings in maintenance and replacement costs.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-CREOSOTED WOOD

and continued in that position until Railway became a wholly owned subsidiary of I-T-E Circuit Breaker Co in the fall of 1948, when he was elected board chairman. Railway is now known as the R&IE Equipment Division of I-T-E Circuit Breaker.

•

Levaur Named Head of Pennsylvania Group

Bernard D. Levaur, vice president of Pittsburgh Reflector Co, has been named president of the Electric League of Western Pennsylvania for 1952.

Other officers elected were: W. T. Thayer, vice president; R. W. Heller, secretary; and W. P. Shreve, treasurer.

Levaur joined Pittsburgh Reflector in 1926 as a sales representative. He served in this capacity until 1944 when he was made vice president, director of sales, and a member of board of directors of the company.

•

Clovis W. Converse has joined Robert P. Smith & Co at Miami, Fla. Converse formerly was associated with the G&W Electric Specialty Co, Chicago, manufacturers of cable devices. The Smith company is a representative of G&W in Florida.

OBITUARY

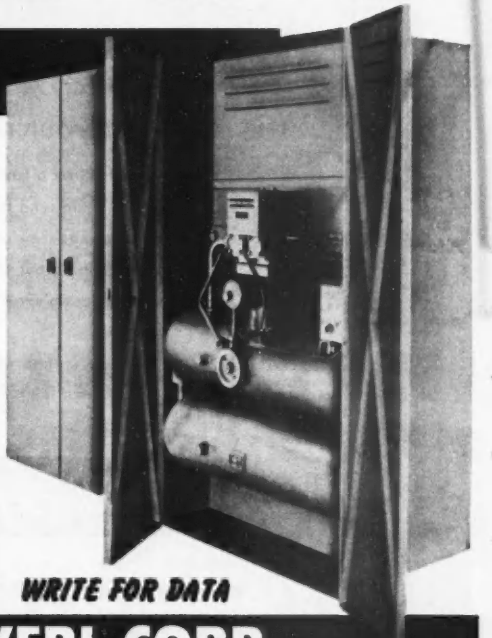
Harold A. Rands, 80, who retired from the Army Corps of Engineers in 1942, died Jan. 8 at Portland, Ore. Rands, who joined the Engineers' staff in 1920, first started his career doing United States land surveys from 1901 to 1909. Later he served as assistant construction engineer of the Estacada hydroelectric development of the Portland General Electric Co. In the Pacific Northwest he conducted hydroelectric power surveys for the Washington Water Power Co, and also headed surveys which determined the sites of Bonneville and McNary Dams.

Dr Ernest Albert Cleveland, 77, a British Columbia engineer and chairman of the Greater Vancouver Water Board since 1926, died Jan. 8 at Vancouver, B. C. Cleveland, who established the engineering firm of Cleveland & Cameron in Vancouver in 1910, was named provincial water rights comptroller and consulting engineer to the B. C. Department of

A METAL ENCLOSED CUBICLE TYPE *air blast breaker* by BROWN BOVERI

NEW

WITH *ALL* THE ADVANTAGES OF *ALL* BROWN BOVERI AIR BLAST BREAKERS



Here's the new industrial- or station-type metal enclosed *"UNITYPE"* AIR BLAST BREAKER with decided *plus values* of importance.

1 READY FOR INSTALLATION! These factory tested and assembled units are ready for setting on foundation and connection.

2 MAXIMUM CONVENIENCE IN MAINTENANCE! All working parts are easily accessible for convenient parts replacement.

3 NO FIRE HAZARD! Absolute freedom from danger of fire and all hazards and inconvenience associated with oil-type switchgear.

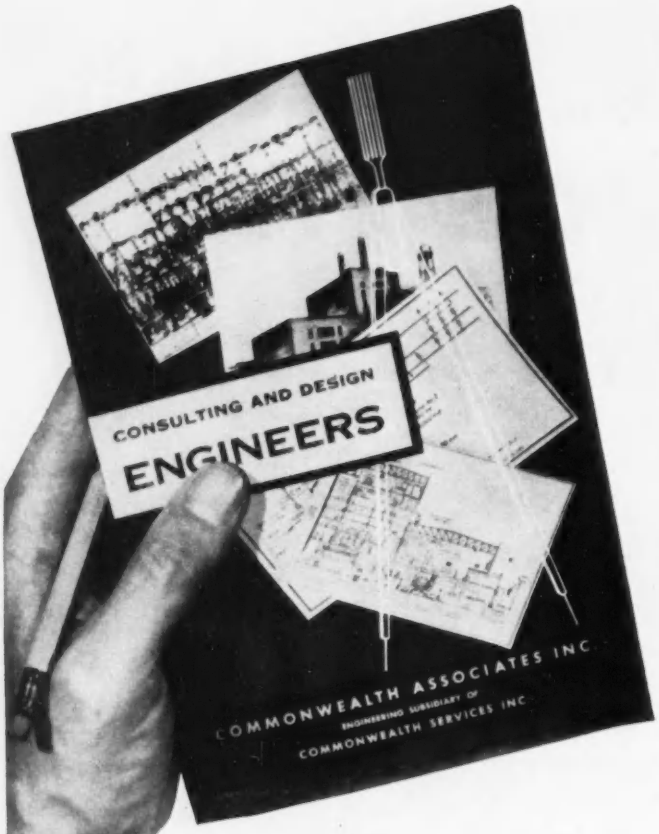
4 NEW PERSONNEL-PROTECTION SAFETY FEATURES! The advanced, well-balanced design incorporates new safety features which protect maintenance and inspection personnel.

"UNITYPE" Breakers incorporate *all* the advantages of all Brown Boveri Breakers. The industrial types (isolated phases) are available from 7.2 kV to 14.4 kV; the Station types (segregated phases) are normally supplied from 7.2 kV to 23 kV, for both indoor and outdoor service. For high voltages only outdoor breakers available.

WRITE FOR DATA

BROWN BOVERI

BROWN BOVERI CORP.
19 Rector St., New York 6, N. Y.



At your request

we will be pleased to send this new, illustrated booklet describing our consulting and design engineering services.

Write Department A
20 Pine Street, New York 5, N. Y.

INVESTIGATIONS
REPORTS
FINANCING
ACCOUNTING
TAXES
INSURANCE
PENSIONS
DEPRECIATION
VALUATIONS
CONSULTING & DESIGN ENGINEERING
METERING
PURCHASING
INDUSTRIAL & PUBLIC RELATIONS
MERCHANDISING
ADVERTISING
GAS CONVERSIONS

Commonwealth Services Inc.

and subsidiaries
COMMONWEALTH ASSOCIATES INC.
COMMONWEALTH GAS CONVERSIONS INC.
20 Pine Street, New York 5, N.Y.
Jackson, Michigan *Washington, D.C.*

Lands in 1919. The new $8.5 million dam being built on the Capilano River in North Vancouver is named after him.

Charles E. Schwenger, 64, chief engineer for the Toronto Hydro Electric System since May, 1951, died at Toronto, Ont., Can., Jan. 14. Schwenger joined Hydro in 1910 and became assistant superintendent in 1912, engineer of distribution in 1913, and assistant chief engineer in 1946.

William R. Waugh, 44, supervisory engineer of system operation for Indianapolis Power & Light Co, died Jan. 5. Waugh, who joined Indianapolis P&L in 1931, specialized in the development and operation of the utility's distribution system.

William H. Torges, 54, general supervisor of the Valley Division of Ohio Power Co, died Jan. 6 at Portsmouth, Ohio.

Herman A. Willis, 52, supervisor of the Richmond, Va., power plant for the E. I. du Pont de Nemours & Co, died Jan. 10 while at work.

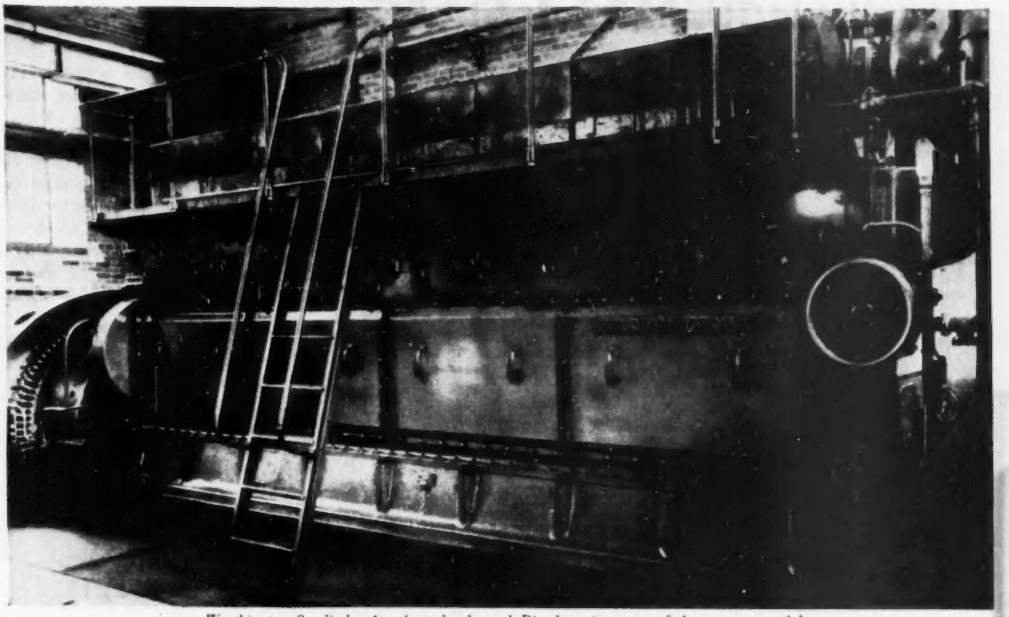
Samuel H. Ketcham, 80, retired U. S. Forest Service electrical engineer, died Dec. 26 in Oakland, Calif. Ketcham joined the Forest Service in 1918 and was primarily concerned with evaluating hydroelectric power possibilities in National Forest areas in Montana and California.

Daniel Francis Kelly, 56, who retired last year as assistant safety director of Consolidated Edison Co of New York, died Jan. 11 at Yonkers, N. Y. He had been with Consolidated Edison for 27 years.

Horace G. Taylor, former manager of the Lawrence (Mass.) Gas & Electric Co, died Jan. 9 at Arlington, Mass. He retired from utility service in 1947.

Nathaniel Laird, 91, who retired six years ago after serving for 30 years as secretary of the Ransom Division of Worthington Pump & Machinery Corp, died Jan. 15, at North Plainfield, N. J.

Louis Tucker Peck, an electrical engineer and vice president and manager of Moloney Electrical Co, St. Louis, Mo., died at Waynesboro, Va., Jan. 7.



Worthington 8-cylinder 4-cycle turbo-charged Diesel engine—one of the two operated by Elko-Lamoille Power Company. This 1000 Kw-rated engine was installed on the same foundation originally built for an engine with 250-Kw rating.

Lesson in Cost Reduction

FROM THE MIDDLE OF THE DESERT

If you've never heard of Elko, you'll find this story interesting.

Elko is the seat of a county in Nevada that, all by itself, is larger than Massachusetts, Connecticut and Rhode Island together, with Delaware thrown in. Since pioneer days, it has been a transportation and trading center.

Elko's present power plant set-up, which includes two four-cycle turbo-charged Worthington Diesel engines connected to 1000-Kw generators, contrasts with the single 50-hp steam engine purchased second-hand in 1896 from a nearby silver mine.

Cost of power has never been more reasonable. Ever since 1940 when fuel oil cost this plant less than half what it does now, power rates have *gone down*—having been reduced twice during the period. Today, 87% of the power is produced by the two Worthington units, and in 1950 the plant averaged 13.3 Kw-hrs per gallon of fuel.

Lubricating oil consumption is low, too—well below the estimated 4,000 rated horsepower hours per gallon.

Want more evidence that there's *more worth in Worthington?* Write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

WORTHINGTON

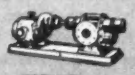
E.1.11

ECONOMICAL CONTINUOUS POWER

Diesel Engines, 150 to 2640 hp
Gas Engines, 190 to 2880 hp
Dual Fuel Engines, 345 to 2640 hp

WORTHINGTON-BUILT AUXILIARIES

Balanced Angle Compressors



Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Coolers

MANUFACTURERS & MARKETS

GE Starts Copper Saving Drive

General Electric's plan to save the scarce metal is prompted by National Production Authority forecasts

General Electric Co has launched an intensified copper conservation drive. The drive is expected to free approximately 10 million lb of strategic copper for vital defense production.

To make this campaign a success, GE plans to use new designs and manufacturing methods that eventually will save more than 13 million lb of copper annually. The company will also substitute aluminum and other metals for copper in the manufacture of many of its products, thus meeting increased production demands with the available copper supply.

GE's decision to make the substitution in its products was based upon National Production Authority forecasts which indicated that more aluminum than copper would be available in the near future.

Present Savings . . . GE is saving thousands of pounds of copper in such diversified products as generators, motors, appliances, radios, television sets, air conditioning equipment, lamps, clocks, and instruments.

About 200,000 lb of copper will be saved this year at GE's huge turbine plant at Schenectady, N. Y., but further savings depend upon results of tests being conducted by GE engineers.

Engineers at the company's Pittsfield transformer plant have focused their attention on the development of new designs for component parts of the transformers. They were able to substitute aluminum for copper in bushing cores, forgings, capacitor cases, and miscellaneous applications. As a result several million pounds of copper were saved this year.

Work to date indicates that it is not feasible to substitute aluminum in place of copper in distribution transformers and still obtain the same kva output from the structure. The conductivity of aluminum per square inch is lower than copper, and this basically requires increasing the size of the coils and in turn the core if the same kva output is to be maintained. This results in a larger tank and more oil, and therefore more materials throughout.

However, aluminum is being applied to replace copper in switchgear bus structures.

Several large experimental motors were built in 1951 using aluminum in the stator windings in place of copper. GE officials said that possibilities for the use of such motors will be thoroughly explored this year.

Consumer Product Field . . . GE has successfully made the switch from copper to aluminum in its washing machine motor line. Now the major portion of the standard GE washing machine motor model is being produced with aluminum windings. In the near future, a portion of another size washing machine motor, as well as other types of fractionals, are expected to be produced with aluminum windings.

Harry A. Winne, GE vice president of engineering, said recently, "There are thousands of cases where we are substituting aluminum and other metals for copper, but we are not making the change unless the quality and the performance of the product is safeguarded in every way."

•

New Aluminum Sheathed Cable Is Put on Market

Marketing of a new type of coaxial cable for microwave uses employing aluminum as the outer conductor and sheath has been announced by Whipple Jacobs, president of Phelps Dodge Copper Products Corp.

The cable uses a flexible spiralled form of polystyrene tape as interior insulation and precise centralizing agent for the inner conductor. There are more than 150 installations in Europe where the cable is used.

In addition to being considerably more efficient, the cable, Jacobs said, will be generally cheaper than cable previously available for microwave use. The tape for the Heinz Horn cables will be produced as Styroflex by National Varnished Products Corp.

The inner conductor is maintained absolutely centralized, even at sharp bends, within the thickness of one tape, namely 2 to 4 thousandths of an inch, a feature of great importance at 2,000 megacycles. This uniformity renders the cable free of reflections which cause ghost images in television and distortion in communications.

Prospective availability of aluminum sheathing for electric power and communications cables makes possible a high strength sheath and opens the field for many new designs. The first quantity production will be for defense purposes and will be fabricated by Felten & Guilleaume Carlswerk, Cologne, Germany, and their new aluminum sheath extrusion process will be available later for application in the U. S.

•

U. S. Plans to Purchase Britain's Tin at $1.18

The United States has agreed to pay Britain $1.18 a lb for 20,000 tons of Malayan tin to be delivered to America during the next 12 months. The figure is 6¢ a lb higher than the $1.12 ceiling price fixed by the Reconstruction Finance Corporation, the government agency which has a monopoly of tin imports.

The agreement, it is believed, carries a provision that if this country buys tin from other sources and pays prices higher than the $1.18 a lb offered to Britain, the contract for Malayan tin may be reopened for the purpose of adjusting the price to be paid Britain.

In addition to establishing the price of tin at $1.18, the transaction may forestall the shutdown of the U. S.-owned Longhorn Tin Smelter at Texas City, Tex., which has been turning out tin for U. S. consumption from concentrates supplied mostly by Bolivian mines. The smelter, the only plant of its type in the Western Hemisphere, was slated to be closed on May 1 unless ore was made available by Feb. 1.

Due to the U. S. refusal to pay Bolivia $1.50 a lb, the American tin supply has been virtually exhausted. The Bolivian contract expired May 31, 1951, and except for a 30-day period when a stop-gap arrangement was in effect, no tin had been shipped to the United States from Bolivia.

The Anglo-American accord is the latest development in a tin situation

A Statement to Anaconda Customers on the Copper Situation

You have vital decisions to make . . . many in connection with the present critical shortages of copper. To help you reach these decisions, there has been much talk and theorizing. Particularly, you have systematically been urged to substitute aluminum for copper.

Substitution poses problems – Let's clear away some of the myths . . . distortions . . . the half-facts that confuse rather than guide. Substitution is difficult and in many instances impossible. But before even considering substitution . . . before you make any final decisions that cost money and affect your future, you should know the facts about the future of copper.

New Anaconda Projects – The first major increase in production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington Project is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons. And projects under way at other properties in the U. S. and friendly foreign countries will then be yielding another 80,000 tons per year.

20% increase by '56 – Thus, in 1954, copper production should be approximately 205,000 tons per year above present levels. During 1955-56 still other new projects will further augment the increasing copper supply.

Accordingly, we estimate that in 1956, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support an FRBI of Industrial Production of 270, an increase of 26% over the present, and 45% above the first half of 1950.

$300,000,000 program – Since the end of World War II, Anaconda has spent, or is about to spend, a total of approximately $300,000,000 in new mining and metallurgical facilities and extensive modernization of brass mills and wire mills.

These are the 'things to come' in copper . . . these are Anaconda's plans for meeting the increasing demands of industry, science and defense.

ANACONDA COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.

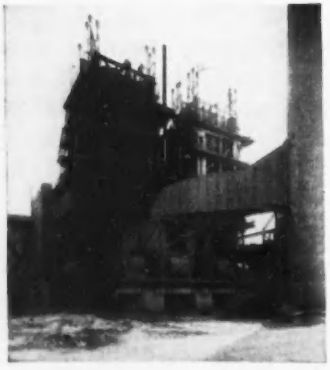
MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

DRAFT FANS GO on GREEN

GREEN FANS . . . Used by Many Leading Utilities

One significant fact about Green Fan Installations at the New Orleans Public Service Plant is that two different boiler manufacturers were involved . . . two different types of boilers but Green Draft Fans for all three boilers. Each boiler has two Green Induced Draft Fans and one Green Forced Draft Fan.

When a concern has specialized on an important piece of power plant equipment for many years, that firm is rightly called the "authority" on the subject. This is the position of Green Fuel Economizer Co. in the field of mechanical draft fans. The name Green is synonymous with Draft Fans highly acceptable to industry.



The Line of Green Induced and Forced Draft Fans includes many types in many sizes which are described in Bulletin No. 168. We shall be glad to discuss your fan requirements with your own engineers, with your consulting engineers and with the boiler manufacturer of your choice.

THE GREEN *Fuel Economizer* COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

which arose following the Korean war. When the price of tin skyrocketed from the pre-Korea price of 74¢ a lb to $1.90 a lb by Feb. 1, 1951, the United States staged a buyer's strike. This action was taken after a Senate subcommittee investigated and the RFC then was named the nation's sole purchaser of tin.

W. Stuart Symington, former administrator of the RFC, generally has been credited with initiating the policy establishing the $1.12 price offered to Bolivian producers.

After this price was set, fruitless efforts were made by the U. S. to negotiate agreements with Bolivian and Indonesian producers. Bolivia is the major supplier of tin ore to the U. S. tin smelter at Longhorn, while Indonesia is the second most important supplier.

The 20,000 tons of Malayan tin which the U. S. has agreed to purchase from Britain approximates our annual volume of imports from that source in normal years.

Aluminum to Set Record

Domestic production of primary aluminum will set a new record of "well over 2 billion lb in 1952 as against 1.6 billion lb for 1951 and 1.8 billion lb in the peak World War II year—1943," Richard S. Reynolds, Jr. president of Reynolds Metals Co. has predicted. According to Reynolds, no other basic metal "approaches aluminum's meteoric rise during recent years." By 1953 aluminum output will be about 100% over 1950 figures, based on present expectations, he added.

SALES ASSIGNMENTS

COMPANY STAFFS

Republic Flow Meters Co. Chicago, has opened new factory branch offices at Houston and Seattle and has moved its St. Louis district office. George H. Woodard was named manager at the Houston office, located at 2426 West Holcomb Blvd. Henry Weber has been appointed district manager of the Seattle office, which is at 1002 Second Ave. William G. Baker is in charge of the St. Louis district office, at 13 South Meramec St., Clayton, Mo.

Metal Prices
Jan. 21, 1952

COPPER, Conn., V., lb	$ .24½
LEAD, N. Y., lb	.19
ZINC, prime Western, E. St. Louis, lb	.19½
TIN, Straits, quot. N. Y., lb	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

TYPES OF MATERIALS TESTED
AND NUMBER OF SAMPLES

	No. Samples Tested
Acoustical Tile	34
Adhesives	1
Advertising Display	7
Air Conditioners	4
Aircraft Instruments	1
Air Dryer	4
Airplane Bearings	1
Airplane Engine	1
Airway Beacon	41
Alloys	2
Aluminum Panels	4
Aluminum Tubing	1
Ambush. Bed Motor	1
Anesthetizer	1
Antenna Rotator	1
Asbestos	1
Auto Signal Lamps	270
Ball Bearings	3
Bank Notes	6
Barbecue Cooker	1
Baseball Field [Lt.]	1
Batteries, Dry Cells	80
Battery Cans, Zinc	5
Binoculars, Electric	6
Blowing	1
Books	124
Buttles, Glass	23
Brake Hose	1
Cable	*40
Calcium Carbonate	5
Carbon Black	1
Capacitors	8
Cast Iron Plate	1
Castors	1
Chalkboards	7
Chicken Wire	1
Cinder Blocks	2
Circuit Breaker	4
Clamps, Outlet Box	4
Clamps, Ground	1
Clay	18
Climbers	25
Clothes Dryer	3
Clothes Washer	1
Coffee Maker	4
Cold Cathode Lamps	51
Compass Fluid	3
Conductors, Copper	150
Convertors	13
Current Limiters	1
Dehumidifiers	1
Deep Fat Fryer	1
Deep Freezers	6
Dishwashers	2
Distributor Caps	2
Egg Cookers	5
Electric Feeder	1
Electric Heater	1
Electric Relays	15
Exit Signs	4
Expansion Fittings	3
Eye Shields	3
Eye Test Equipment	2
Fabrics	4
Facilities Furnished	138
Factory Inspection	584
Fans, Electric	2
Faucet, Electric	1
Fiber Glass	3
Film	1
Filters	42
Flame Head	61
Flasher, Electric	1
Flashing Lamp	1
Flat Iron	28
Flat Iron, Steam	4
Floodlights	4
Flooring	14
Fluoresc. Lp. Ball st 3610	1
Fluoresc. Lp. Fixt.	366
Fluoresc. Lp. Unit. 15768	1
Fluorescent Lamps	150
Furnace Blower	1
Furnace	1
Gauges	31
Gauges, Fuel	3
Gauges, Pressure	1
Gear Box	1
Generator	1
Glass	21
Glass Globes	10
Glass Panels	230
Glass Plates	20
Glass, Safety	72
Glass Shades	13
Glue	1
Grounding Devices	6
Hair Dryers	6
Headlamps	45
Headlgs.—Motorcyc.	2
Hospital Sheeting	34
Illumination Tests	3
Inc. Lp. Fixtures	66
Inc. Lp. Reflectors	182
Incandescent Lamps	311
Inc. Lp., Life Test	13
Incubator—Baby	1
Ink	1
Instrument Check	90
Instrument Dials	6
Instrument Panel	1
Instrument Rental	139
Instrument Repair	4
Instrument Stain	1
Installed Equip. Chk.	1
Installed Tools	3
Insulated Wire	40
Insulating Compound	2
Insulating Materials	47
Insulating Tape	24
Insulators	11
Insulators, Glass	1
Insulators, Moulded	1
Iron, Angle	1
Irons, Electric	12
Kitchen Mixer	2
Labels & Tags	—
Lamp	9
Light Cells	6
Lighter Fluid	2
Lighting Supports	2
Linoleum	3
Lipstick	6
Liquids	6
Lockouts	1
Lotions	10
Luminous Tape	1
Matting, Rubber	18
Metal Plates	7
Microscopes	3
Mirrors	47
Motion Pic. Screen	29
Motors	2
Motor Generator Set	1
Neon Flasher	2
Oil	19
Oil, Fuel	12
Oil, Transformer	1
Operating Rooms	1
Oxygen Tent	1
Painted Panels	48
Paint	91
Paper & Paper Prod.	73
Pencil Leads	3
Percolator	1
Phone Plugs	4
Photo Exposure Mtr.	4
Photoflash Lamps	10
Photometer Cal.	1
Pigments	31
Plastic Tape	6
Plastics	126
Plexiglass	2
Polystyrene	2
Porcelain	7
Porcelain, Comm. Metal	1
Portable Lamp	8
Powder	2
Power Survey	1
Precision Instr.	15
Pressure Cooker	1
Public Add. System	1
Pulp Handsheets	9
Pyranol	1
Radiant Materials	2
Radio Amplifiers	2
Radio Receivers	2
Radio Tubes	21
Radio Towers	14
Rayon Compound	9
Range, Electric	14
Range, Surf. Units	10
Rayon Fabrics	3
Reactor	1
Rectifier	2
Reflectance Meas.	3
Reflecting Strips	43
Reflectometer	1
Reflex Reflectors	28
Refrigerators	46
Resins	4
Relays, Current	1
Reports, Copies of	—
Resistors	5
Room Cooler	1
Rope	2
Rubber	1
Rubber Blankets	542
Rubber Boots	5
Rubber Couplings	6
Rubber Gloves	6940
Rubber Hoods	171
Rubber Hose	497
Rubber Mats	2
Rubber Overshoes	2614
Rubber Pigs	4
Rubber Protectors	250
Rubber Sleeves	1109
Salinity Cell	1
Sign Brine	2
Satin	2
Sealed Beam Lamps	67
Service Buses	1
Sewing Mach., Elec.	1
Signal Lens	14
Solder	3
Solutions	7
Spark Plugs	1
Speed Guns	2
Spotlight	1
Standard Lamps	204
Stds of Brightness	2
Steatite	1
Steel	4
Steel Sheet	29
Steel, Strap	4
Stencils	3
Sterilizer	1
Street Lighting Fixt.	11
Strip Marker	1
Sunburn Preventive	13
Sun Lamp	2
Switch Assemblies	26
Switches	1520
Swivel	1
Tape Lines	4
Tea Kettle	1
Telephone Receivers	470
Test Equip. Cal.	17
Textiles	30
Thermocouple Wire	2
Thermostats	10
Tile	2
Tile, Floor	3
Tobacco	20
Tonometers	253
Tonometer Plunger	323
Tornados	3
Transformers	4
Transformers, Airpt.	1
Transformers, Core	14
Transformers, Cur.	1051
Transformers, Pot.	61
Transformers, Dist.	5
Transformers, Inst.	387
Transformers, Wdgs	3
Transmitter, Elec.	1
Vacuum Cleaner	20
Vaporizer	1
Varnish Remover	2
Vending Machine	1
Waffle Grill	1
Wallboard	2
Washing Machine	5
Watches	3
Watch Cases	9
Water Heater	19
Water Htr. Elements	99
Water Meter	2
Watthour Meters	4
Wave Guide Assem.	1
Wax	2
Wax, Floor	1
Wire, Copper	1
Wire, Magnet	3
Wire Holders	48
Wire Crystals	5
Yarn	1
Grand Total—No. of Samples Tested: 112,186	

TREND DATA
for your
REFERENCE FILE

in view of

(a)

Revised Product Standing due to changing markets

(b)

Revised Production depending upon material availability

This trend is pointed up through analysis of the 1950 business at . . . . . ELECTRICAL TESTING LABORATORIES, INC.

2 East End Ave. at 79th St., N. Y. 21

INSPECTION and CERTIFICATION OF FACTORY PRODUCTS

Cable . . . . . 1,140,000 ft.

Lighting Equipment . . 36,500,000 units

This condensation of ETL Services to Production and Marketing sent

ON REQUEST

DISTRIBUTION OF CLIENTS
AND ORDERS BY STATES

	No. Cities & Towns Represented	No. Clients	No. Orders	Total Samples
Alabama	1	1	1	1
Arizona	1	1	1	1
Arkansas	1	1	4	4
California	9	16	48	79
Colorado	1	1	1	6
Connecticut	10	41	150	8,173
Delaware	3	4	10	285
Dist. of Columbia	3	3	40	1,550
Florida	5	5	13	1,491
Georgia	2	2	4	11
Idaho	—	—	—	—
Illinois	12	91	307	3,508
Indiana	5	7	80	1,842
Iowa	—	—	—	—
Kansas	2	2	2	10
Kentucky	1	1	1	4
Louisiana	2	2	2	2
Maine	2	2	3	5
Maryland	4	5	6	222
Massachusetts	20	30	243	17,934
Michigan	12	24	93	622
Minnesota	3	5	7	37
Mississippi	—	—	—	—
Missouri	3	13	49	92
Montana	1	1	1	1
Nebraska	1	1	1	3
Nevada	—	—	—	—
New Hampshire	5	5	24	1,272
New Jersey	56	128	417	18,819
New Mexico	—	—	—	—
New York	70	472	1,076	31,485
North Carolina	9	9	20	416
North Dakota	—	—	—	—
Ohio	24	54	235	1,480
Oklahoma	1	1	1	15
Oregon	—	—	—	—
Pennsylvania	35	91	358	18,434
Rhode Island	4	6	11	57
South Carolina	3	3	3	29
South Dakota	—	—	—	—
Tennessee	6	7	10	21
Texas	2	3	5	58
Utah	—	—	—	—
Vermont	4	5	16	2,151
Virginia	10	13	38	1,644
Washington	2	6	13	1,092
West Virginia	5	6	8	34
Wisconsin	9	10	17	33
Wyoming	—	—	—	—
Territories	1	1	1	7
Foreign	5	6	13	828
States & Territories—Totals	356	1,001	3,388	112,186

TYPES OF CLIENTS — the makers of

Abrasives
Acoustical Tile
Advertising Displays
Airplanes
Aluminum
Appliances
Asbestos
Automobiles
Auto Parts
Ball Bearings
Bank Notes
Batteries
Boilers
Books
Bores
Bookboard
Business Machines
Cable
Capacitors
Cement
Ceramics
Chemicals
Chalk Boards
Chewing Gum
Chord
Circuit Breakers
Clamps
Clay
Clocks
Cl. Wringers
Coke
Cosmetics
Dressing Materials
Electrical Supplies
Elevators
Fabrics
Fiber Glass
Flooring
Food
Foundry
Furs
Fuses
Gas Appliances
Glass
Glue
Gypsum
Handbags
Induction Heaters
Insulating Materials
Instruments
Lighting Fixtures
Lithographs
Linoleum
Locomotives
Magnetos
Maps
Medical Supplies
Metals
Milk
Motion Picture Screens
Oil
Oil Engines
Optricals
Paint & Varnish
Paper
Photographic Materials
Plastics
Porcelain Enamel Ware
Porcelain Lathes
Printing
Pulp
Radio
Radium
Radiators
Ranges, elec.
Reflecting Tape
Rheostats
Rope
Rubber Goods
Safety Devices
Scales
Seal Caps
Sewing Machines
Ships
Signs
Soft Drinks
Soap
Steel
Switches
Switchboards
Tanners
Telephones
Television Equipment
Thermostats
Tire Repair Parts
Tobacco
Tools
Transformers
Vending Machines
Wallboard
Watches
Wax
Weatherstrip
Wire
X-Ray Equipment

DEALERS

Autos
Chain Stores
Co-Ops
Dept. Stores
Elec. Supplies
Exporters
Ice
Jobbers
Mail Order Companies
Milk
Paper

OTHERS

Banks
Broadcasters
Business Researchers
Constructors & Builders
Dock Operator
Engineers
Fed. & State Authorities
Hospitals
Insurance Companies
Laboratories
Lawyers
Meter Service Co.
Motion Pict. Producers
Municipal Officers
Newspapers
Observatory
Parks, State & National
Physicians
Publisher
REA
Railroad
Real Estate Operator
Refrigerator Co.
Street Railways
Street Lighting Co.
Telegraph Co.
Telephone Co.
Trade Association
Truckers
U. S. Air Force
U. S. Army
U. S. Navy
U. S. Veterans Admin.
Universities
Utilities, Gas
Utilities, Electric
Utilities, Water
Zoological Society

FITS EVERY LINEMAN!

NEW

Buckingham Adjustable Climbers

Now—one pair of climbers that fits tall men, short men—all men on the crew! One pair of climbers that accommodates the various thicknesses of footgear and clothing worn in different seasons!

New Buckingham Adjustable Climbers are quickly and easily adjusted from size 15" to size 18" by means of an oval head set screw and lock washer, assuring exact fit. If desired, leg irons can still be bent to follow the shape of the wearer's leg.

These advanced-design climbers permit utilities to carry a smaller stock of climbers. They are eminently practical as extra climbers. And—because they will fit any worker—they're ideal for sub-station, plant or service truck.

Famous Buckingham Quality, Safety, Comfort

Buckingham Adjustable Climbers can readily be fitted with leg and foot straps, and deluxe leather pads filled with rubberized wool for greater comfort. Gaffs are permanently attached to the leg irons, pitched at an angle which permits closer standing to the work—less chance of cut-out—easier climbing.

Standardize on Buckingham Adjustables. Fewer pairs are needed to keep every man working.

Ask about them at your supply house — or write for further information.

BUCKINGHAM MANUFACTURING CO., INC.
1-3 TRAVIS AVENUE BINGHAMTON, N. Y.

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo. furnishing, del. f.o.b. cars shipping point or f.o.b. cars Loveland, Colo., transformers, potential devise complete, for Flatiron Power and Pumping Plant Switchyard, Colorado-Big Thompson Proj., Spec. DS-3635. L. N. McClellan, ch. engr.

Colo., Colorado Springs—City, R. F. Sonekson, clk., power plant, $2,500,000. Lutz & May, 819 Finance Bldg., Kansas City, Mo., engrs.

Ga., Albany—Dpt. Navy, Office in Charge of Construction, Box 365, Naval Base, S. C., 12,500 volt main sub-station and equip. at Marine Depot of Supplies, NOY 70661. Plans deposit $10.

Idaho—U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash., hydro-electric power house, Albeni Falls Proj., Priest River, Serial No. CIVENG 45-108-52-29.

Ia., Humboldt—Corn Belt Power Cooperative, Humboldt, Section 4, of Humboldt generating plant, building and outside work, vent fans, drains, electr. manholes, head wall, substa. foundations, site work and water piping; Section 5, electrical work for power plant; Section 6, mechanical work at power plant. Stanley Eng. Co., Hershey Bldg., Muscatine, engr.

Kansas—Central Kansas Electric Cooperative, Great Bend, 455 mi. rural distr. lines, 18.79 mi. service lines, 7.25 mi. transmission lines, 2.13 mi. underbuilt lines, 51.55 mi. of line changes, Barton, Edwards, Hodgeman, Ness, Pawnee and Rush Counties, $600,000, Frank Horton & Co., Lamar, engrs.

La., Plaquemine—Town, concrete work, mechanical work and piping for electric generating unit. Plans deposit $15. Bernard & Burke, 1023 Nicholson Dr., Baton Rouge, engrs.

Mhich., Battle Creek—Dpt. Army, Post Engineer, Bldg. 1770, Fort Custer, Emergency Generator Bldg. 1770, incl. necessary overhead aerial work, Fort Custer, Eng. 20-006-52-16.

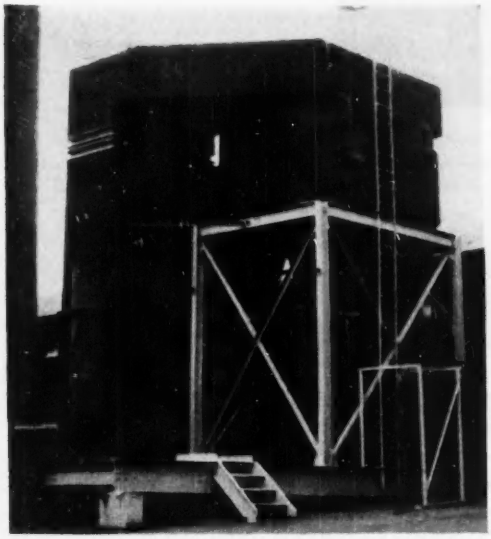
Mich., Kinross—U. S. Eng., 1900 Cadillac Tower, Detroit, Zone 26, electrical sub-station, distr. sys., Kinross Air Force Auxiliary Field, Eng. 20-064-52-37; power plant and steam distr. sys., Kinross Air Force Auxiliary Field, Eng. 2-064-52-38. Plans deposit $15 each.

Montana—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point, or f.o.b. cars Hungry Horse Dam, six 100-kva and two 75-kva noninflammable liquid-immersed self-cooled, outdoor-indoor distribution transformers, Hungry Horse Dam, Hungry Horse Proj. Spec. DS 3624. L. N. McClellan, c/o owner, ch. engr.

Montana—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, installing electric elevator for Canyon Ferry Dam, Helena-Great Falls Div., Canyon Ferry Unit, Missouri River Basin Proj., on Missouri River about 16 mi. northeast of Helena. Spec. CD 3628.

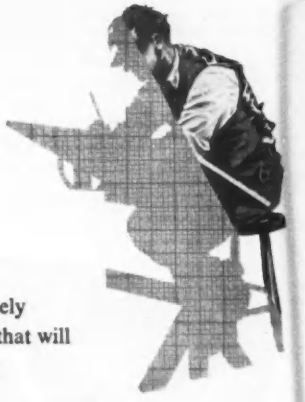
New Mexico and Texas—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Deming, two 69,000 volt outdoor potential transformers; two 69,000 volt outdoor current transformers; one outdoor meter cabinet for Columbus Co-operative Substation, Rio Grande Proj. Inv. No. 3625.

N. Y., New York—Bd. Water Supply, 120 Wall St., Zone 5, Contr. 414, furnishing, testing, del. two 150-kva indoor unit sub-stations, and two 45-kva indoor and three 15-kva outdoor transformers for Neversink and East Delaware intake chambers and the Downsville release water chamber of the Delaware Aqueduct;



After an exhaustive study, engineers at a Southern paper mill selected Buell van Tongeren Cyclones for their three pulverized-coal-fired boilers.

How to Keep Stack Dust Down Now



- ***This industrial 'dust' man can help determine the Dust Abatement System most efficient for you!***

The Buell organization of industrial 'dust' men is devoted solely to the design and construction of dust collection equipment that will most efficiently and economically solve your plant's specific Stack Dust problem.

For more than 18 years we have been doing just this for all American industry. Every Buell installation is a custom-designed system, engineered to hold stack dust discharge down to the practical limits which assure new profits, improved product and/or process, better plant-community relations, higher levels of employee morale.

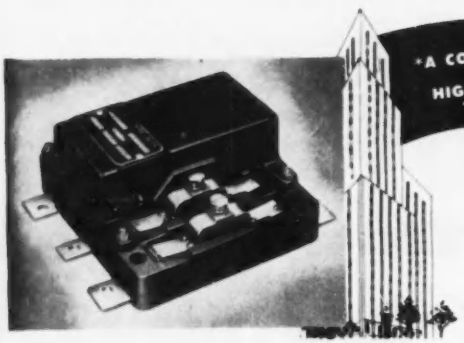
For full information about Buell's **3 basic systems** of dust collection, and how one can be applied to the solution of your stack dust problems, write today. Ask for the new, informative bulletin titled, "The Collection and Recovery of Industrial Dusts."
Buell Engineering Company, Dept. 60-A.
70 Pine Street, New York 5, N. Y.

ELECTRIC CYCLONIC

buell

HIGH EFFICIENCY CYCLONES • ELECTRIC PRECIPITATORS
TYPE 'LB' COLLECTORS • LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS • DUST HOPPER VALVES

ENGINEERED EFFICIENCY IN DUST COLLECTION



*A CONTROL MUST FOR HIGH BAY LIGHTING

...instant disconnect of lighting and power feeders from remote panel

*THE SWITCH TO PROVIDE THIS SERVICE!

...the ASCO Remote Control Switch now made in capacities up to 1000 amperes

Are you laying out the electrical circuits for a large building—a factory—a hangar—an auditorium—an institution? Buildings with extensive high-lighted working bays?

Instant remote disconnect of lights and power circuits is a "must", if both safety and economy are objectives.

Remote controls for instant disconnect protect workers and machinery. They eliminate multiple heavy feeder lines, thus saving on installation costs.

The ASCO Line of Remote Control Switches, similar to the switch illustrated, now ranges up to 1000 amperes in capacity. Write us about your requirements.

ASCO Electromagnetic Controls

Automatic Switch Co.

357 Lakeside Avenue Orange, New Jersey

S-31-1

We also manufacture a complete line of Solenoid Operated Valves for Automatic and Remote Control of Liquids and Gases

Electromagnetic Controls For All Industry

From the smallest hand operated, to the large motor operated, MURRAY Gate Hoists are designed and built in a wide range of capacities, from less than 1 ton to over 100 tons. During our over half century of designing and building gate hoists, we have developed many designs for the different types of gate hoist problems. Perhaps we have several designs and patterns that will fit your requirements. In planning gates or gate hoists, we suggest you communicate with us before your plans for the project as a whole, are complete . . . it will save expense and much preparation time. We also build gate hoists especially from your plans and specifications, if desired.

Our Engineering Department is at your service any time, to help you solve problems involving Power Dam Gates and Gate Hoists.

D. J. MURRAY MANUFACTURING COMPANY

Manufacturers Since 1883

WAUSAU · WISCONSIN

Contr. 329, furnishing, del., installing, testing chlorinating equip. for Roundout, West Branch and Kensico South effluent chambers of Delaware Aqueduct in Towns of Wawarsing, Ulster Co., Carmel, Putnam Co., and Mount Pleasant, Westchester Co.

N. Y., Cold Spring—U. S. Eng., 80 Lafayette St., New York, Zone 14, steel, concrete battery plant, incl. sewer water, electric utilities, and access roads. $700,000. Plans deposit $15.

Ohio—South Central Rural Electric Cooperative, Lancaster, 12 mi. 69-kv transmission line, 27 mi. tie line, sub-stations and sys. imprvs., Fairfield Co. $560,000.

O., Columbus—U. S. Eng., 237 Fourth Ave., Huntington 18, W. Va., electric power facilities at Lockbourne Air Force Base, ENG 46-022-52-93.

Oklahoma—Canadian Valley Co-operative, Seminole, 249 mi. rural distr. lines near Seminole, Seminole Co. $730,000. E. R. Taylor & Assoc., 4107 Aell St., Tulsa, consult. engrs.

Oklahoma—Southwestern Power Admin., P. O. Drawer 1619, Tulsa, Zone 1, switching station at Tupelo, Coal Co. $125,000.

Oregon—U. S. Eng., City-County Airport, Walla Walla, Wash., nine 56,800 kva. transformers for McNary Dam, CIVENG 45-164-52-62.

Pa., Phila.—Civil Aeronautics Admin., Dpt. Commerce, Federal Bldg., New York International Airport, Jamaica, N. Y., wood frame radar equip. bldg., access road, underground duct sys. on airport from this bldg. to present terminal bldg., install power and control cables, construct partition, install conduits, switch, cables, etc. in Terminal Bldg., etc. for precision approach radar facility at Philadelphia International Airport, Proposal No. 152-1075H1

South Dakota—Bureau Reclamation, Dpt. Interior, Huron, furnishing labor and materials, performing all work for construction of Armour Substation, Spec. DC-3626; construct Tyndall Sub-station, Spec. DC-3627, Transmission Div., Missouri River Basin Proj.

Va., Danville—City, electrical work for new addn. to Brantley Steam Plant. Plans deposit $25. Charles T. Main, Inc., 80 Federal St., Boston, Mass., engr.

Washington—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, powerhouse, intake structure and appurtenances for Chief Joseph Dam, Bridgeport, CIVENG 45-108-52-28, $45,000,000. Plans deposit $50.

Wyoming—Bureau Reclamation, Dpt. Interior, Billings, Mont., one 2,000 kva transformer with six lightning arresters, one 5 kva transformer, 3 air switches, 9 disconnecting switches, 4 disconnecting fuses, 3 fuse cutouts, three current and three potential transformers, Missouri River Basin Proj. Spec. 6008-87. L. N. McClellan, Bldg. 1a, Denver Federal Center, Denver, Colo., ch. engr.

Wyoming—Montana—Bureau Reclamation, Dpt. Interior, Cody, Wyo., Lovell-Yellowtail 115-kilovolt transmission line, transmission Div., Missouri River Basin Proj., Spec. DC 3555.

Low Bidders & Contracts Awarded

No. Car., Roanoke Rapids—Stone & Webster Eng. Corp., 40 Federal St., Boston, Mass., CA. Approx. $27,000,000. hydro-electric power plant and dam in Roanoke River. Virginia Electric & Power Co., 7 and Franklin Sts., Richmond, Va., Charles T. Main, Inc., 80 Federal Sts., Boston, Mass., engr.

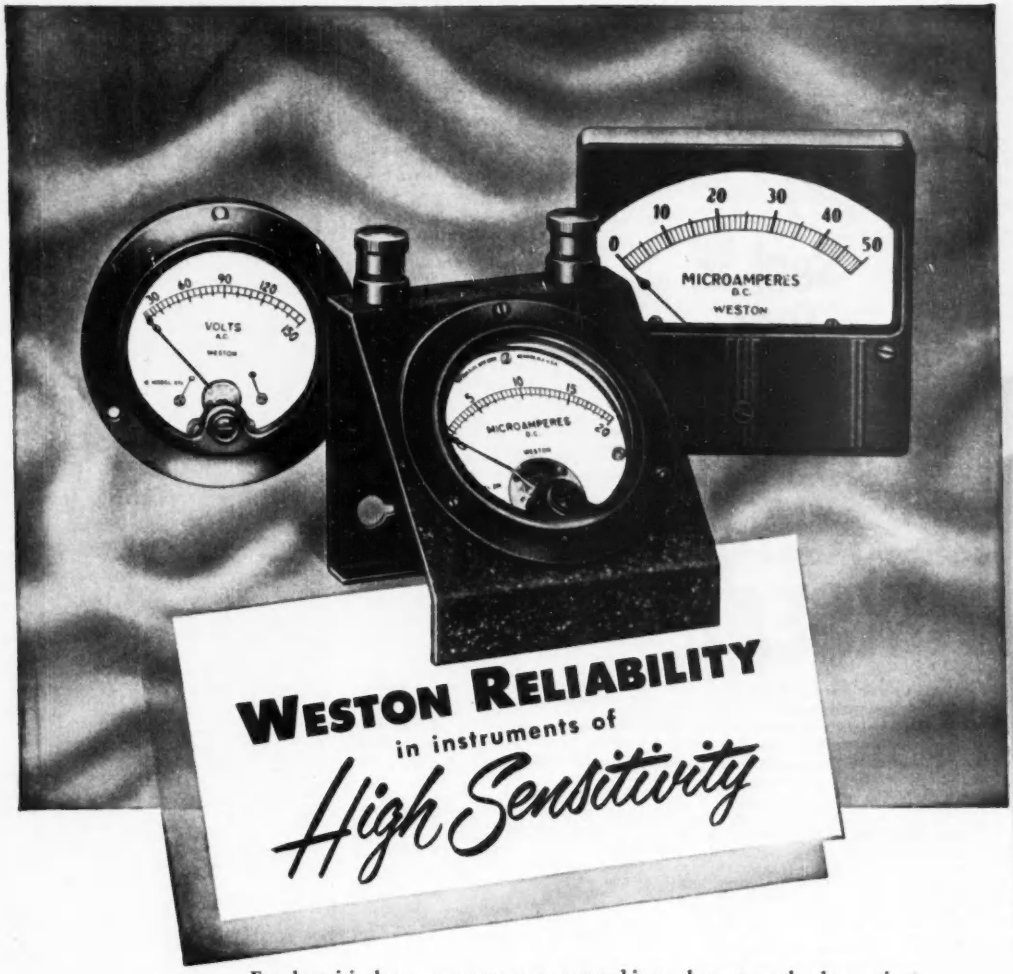
INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Mass., Boston—City, Mayor's Office, City Hall, plans by Harold Knight, 11 Beacon St., civic center, Boylston, Exeter-Dalton Sts., and Huntington Ave. $35,000,000, Fay, Spofford & Thorndike, 11 Beacon St., consult. engrs.

W. Va., Moundsville—Allied Chemical & Dye Corp., 61 Broadway, New York, N. Y., chemical plant on 400-acre site at Round Bottom Bend on Ohio River, 2 mi. south of here, $15,000,000.

B. C., Vancouver—Celgar Development Co., c/o Celanese Corp. of America, 180 Madison Ave., New York, N. Y., U. S. A., wood pulp and newsprint development in Arrow Lakes area of southeastern B. C., near Castlegar, $65,000,000.



WESTON RELIABILITY

in instruments of

High Sensitivity

For the critical measurements encountered in nuclear research, electronics or in general test procedure, WESTON supplies a broad line of instruments in types and sizes for all requirements. All embody true WESTON precision and dependability; and all D-C, rectifier type A-C and RF instruments have inbuilt magnetic shunts which permit minor field adjustments if necessary. Complete information is available from the WESTON representative near you, or direct; and full cooperation on special instrument requirements is freely offered. Weston Electrical Instrument Corporation, 594 Frelinghuysen Ave., Newark 5, N. J., manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

HANDY ANDY SAYS,

Seal it fast ...seal it to last with

Johns-Manville

DUXSEAL

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for sealing duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package for smooth, workmanlike jobs. Every electrician should keep a package in his tool box for on-the-spot use.

Stays plastic—Duxseal stays plastic indefinitely. Will not slump, melt or run under ordinary temperatures.

Stays tight—Clings to duct walls and cables but flexes with expansion and contraction of the cable.

Stays insoluble—Unaffected by ground waters and gases.

Stays harmless—Will not injure workmen's hands or react with rubber, metals or painted surfaces.

Tight seals for other electrical uses:

J-M Tranolseal . . . for use against refined oils employed in transformers, switches and similar equipment.

J-M Uniseal . . . for caulking equipment outdoors or in fume laden areas. Resists temperatures up to 180° F.

If you would like to know more about Duxseal and other J-M labor-saving sealing compounds, write Johns-Manville, Box 290, New York 16, N. Y. In Canada, write 199 Bay Street, Toronto, Canada.

JM

Johns-Manville

SEALING COMPOUNDS

CATALOGS • BULLETINS

● Tractors: Allis-Chalmers has issued a bulletin on tractors and their use in economic coal storage. Profusely illustrated, safe and orderly coal handling methods are discussed. Tractor Div, Advertising Dept 1, Milwaukee, Wisc.

● Pump Motors: E-M Synchroniser No. 33 deals with large pumps and the application of ac motors to them. A storm water pumping project in Detroit is discussed. Other articles cover applications of large ac motors to centrifugal pumps, cooling water pumping in the petroleum industry, and the use of variable speed magnetic drive on pumping applications. Electric Machinery Mfg. Co, Minneapolis 13, Minn.

● Solder Catalog: This 36-page booklet on the nature, properties and uses of solder is profusely illustrated. Sections are devoted to thermal effects, mechanical properties and principles of soldering and fluxes. Selection of proper solder for a job, fusible alloys, low melting point alloys are also discussed. ASTM, SAE, Federal and Military specifications are included. Federated Metals Div, American Smelting and Refining Co, 120 Broadway, New York, N. Y.

● Conduit and Cable Fittings: Bulletin 65 has 64 pages and lists in complete easy-to-find form electrical conduit fittings and cable fittings for all types of raceways. Included are locknuts, bushings, elbows, pipe straps, conduit supports, connectors and couplings for rigid conduit. Also included for EMT are armored cable, nonmetallic sheathed cable and service entrance cable. All material is grouped according to the raceway it serves. Information about conduit dimensions, bolt and screw sizes, etc. is included. The Thomas and Betts Co, Inc, Butler St, Elizabeth, N. J.

● TEFC Motors: This bulletin describes types of construction and ratings of improved totally-enclosed, fan-cooled motors with tube-type, air-to-air heat exchangers. Included is a chart showing ratings of Allis-Chalmers TEFC motors available in squirrel-cage, wound-rotor and synchronous types for both horizontal and vertical installation. Bulletin 05B7150A available from Allis-Chalmers Mfg Co, 932 So 70 St, Milwaukee, Wisc.

● School Lighting: A revised 20-page ABC Plan School-Lighting booklet, B-4556-A, outlines six basic points that should be considered before buying a lighting system, and applies these points to several problems typical to most schools. Complete data and sketches for eight sample lighting layouts, and descriptions of seven types of luminaires are included. Westinghouse Electric Corp, Box 2099, Pittsburgh, 30, Pa.

● DC Dynamometers: A two-color booklet, GEA-5552, describes the GE cradled, 250-v, dc dynamometers for direct connection testing of internal combustion engines, electric motors, pumps, blowers, and compressors. Equipment applications and operation are described. A number of actual installation photographs, tables of full load horsepower and speed ratings, typical performance curves and a cut away view of a dynamometer are included. General Electric Co, Schenectady 5, N. Y.

● Power Distribution Equipment: I-T-E Catalog 9000 describes unit substations, switchgear and circuit breakers for a new or expanding power distribution system. Unit substations from 300 to 2000 kva at primary voltages of 15 kv and below are illustrated. Write I-T-E Circuit Breaker Co, Philadelphia 30, Penna.

NEW STONCO "Cushion-Seal" LAMP HOLDER

for EXTRA LAMP LIFE with ANY LAMP in ANY WEATHER

Adds hours to lamp life by ending your worst lamp headaches. All-weather seal fits *all* lamps—long or short, PAR-38 or R-40—assures maximum lamp cooling and faster heat dissipation. Cushion-Seal includes high-temperature silicone rubber with pressed asbestos sheet barrier and aluminum sheet lock. Weatherproof cast aluminum throughout.

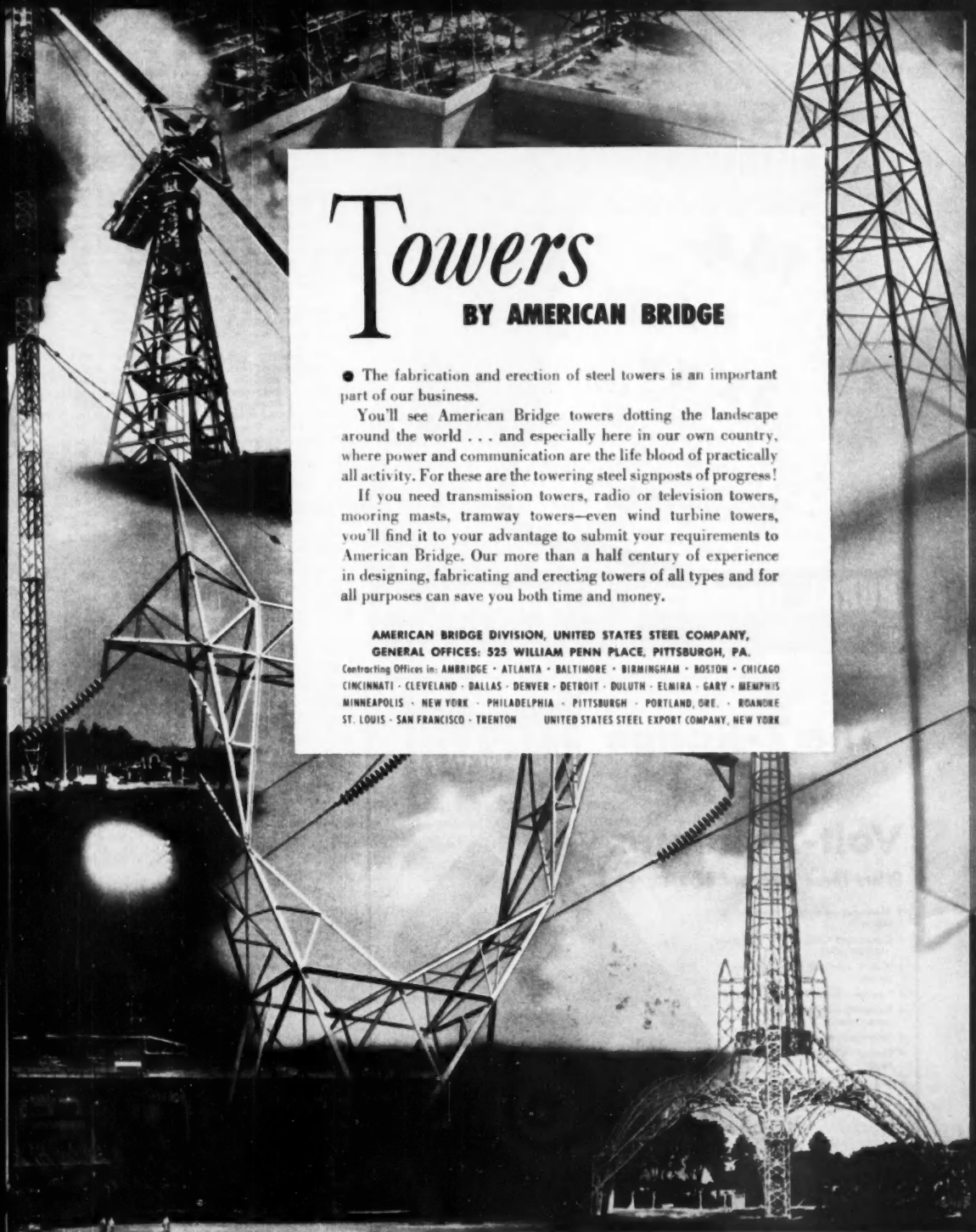
100,000 CANDLEPOWER for only 300 WATTS

Stonco Super Spot No. 56 is the most powerful 300W sealed-beam spotlight ever made. Long-range, oval-shaped beam can be rotated to exact fixed position desired. Available with all standard mountings. Weatherproof cast aluminum throughout.

STONCO ISLAND AREA LIGHT

Porcelain-enamel, heavy steel reflector with built-in cast aluminum bonnet already tapped for 1 to 5 lamp holders — no accessories needed. Removable cast aluminum front cover plate and hollow double-arm yoke saves an hour's wiring time per unit. Write Stonco Electric Products Co., 485 Henry Street, Elizabeth 4, New Jersey.

STONCO



Towers

BY AMERICAN BRIDGE

● The fabrication and erection of steel towers is an important part of our business.

You'll see American Bridge towers dotting the landscape around the world . . . and especially here in our own country, where power and communication are the life blood of practically all activity. For these are the towering steel signposts of progress!

If you need transmission towers, radio or television towers, mooring masts, tramway towers—even wind turbine towers, you'll find it to your advantage to submit your requirements to American Bridge. Our more than a half century of experience in designing, fabricating and erecting towers of all types and for all purposes can save you both time and money.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL COMPANY,
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · DULUTH · ELMIRA · GARY · MEMPHIS MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH · PORTLAND, ORE. · ROANOKE ST. LOUIS · SAN FRANCISCO · TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN BRIDGE

UNITED STATES STEEL

The 7-Range
Clip-On
Volt-Ammeter
FERRANTI
Offers These Important Advantages
• Measures up to 1000 amps—up to 600 volts.
• Convenient ONE HAND operation—trigger action.
• Thumb operated range selector switch.
• 7 ranges—5 current and 2 voltage.
• Insulated core—shockproof construction.
• Takes cables up to 2¼" diameter.
• Distinct calibrations—easy to read.
• Suitable for 50-70 cycles.
RANGES: 0-10 amps; 0-25 amps; 0-100 amps; 0-250 amps; 0-1000 amps; 0-150 volts; 0-600 volts.
FERRANTI ELECTRIC, INC.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
FERRANTI, LTD., Hollinwood, England
FERRANTI ELECTRIC, LTD., Toronto, Canada

● Transformers: Moloney hipercore transformers are described in bulletin H-305. Conventional and CSP distribution transformers are described. Single phase units 3 to 100 kva, operating at 15,000 volts and below are included. General information on transformers with many illustrations make this bulletin interesting. Write to the Moloney Electric Co, St. Louis, Mo.

● Single Phase Inductrols: Publication, GEA-795 describes the GE single-phase low-voltage dry-type induction voltage regulator. Features of the redesigned inductrol equipment, its application and operation, plus sketches, line drawings and charts showing operating connections are included. Also given are complete price and purchasing data on the new line of equipment, rated 0.3 kva to 24 kva, for use in circuits rated 3 kva to 240 kva. General Electric Co, Schenectady 5, N. Y.

● Batteries: A 56-page pocket-size handbook of technical instructions and engineering data on the care of motive-power storage batteries has been issued by Gould-National Batteries. A major addition is a six-page section on battery charging. The book contains sections on theory of the lead-acid battery, followed by practical sections on care and operation, maintenance and repairs, parts and technical data on batteries. Gould-National Batteries, Inc, Trenton 7, N. J.

● Oxygen Recorder: The magno-therm oxygen recorder bulletin includes sections on applications of the instrument; an illustrated explanation of how an analysis is made using the paramagnetic properties of oxygen; operation of various gas sampling systems used with the instrument, and a chart-illustrated discussion of results obtained with the oxygen recorder in several installations. Bulletin 51-829 available from Hays Corp, Michigan City, Ind.

● Secondary Sectionalizing Breaker: Two color bulletin 3015 describes the Heinemann Type 400 control unit for banked secondary systems. The bulletin describes the units's new advantages to the banked secondary system, as well as factory applications in protecting bus ducts and overhead wiring. Write O.S.E. Dept, Heinemann Electric Co, Trenton, N. J.

● Battery Chargers: Motor-generator battery-charging equipment is described in bulletin 11-210. Bulletin describes equipment in detail and includes table of engineering data on chargers for lead-acid batteries or for Edison batteries. The Electric Products Co, 1725 Clarkstone Rd, Cleveland 12, Ohio.

● Copper Weights: A new bulletin, Copper Weights of Electrical Wires and Cables, has been published by Rome Cable Corp. Designed to be of assistance to those who must report their requirements and past usage of wire and cable in terms of copper poundage. Pounds of copper per 1000-ft are listed for most common sizes and types. This 10-page bulletin available from Rome Cable Corp, Rome, N. Y.

● Unistrut: A 78-page comprehensive fully illustrated construction catalog has been issued by Unistrut Products Co. Catalog 700 is a simple, easy to use manual on how to frame, hang, mount and support many kinds of mechanical and electrical equipment with Unistrut. Profusely illustrated and complete with data on product and applications, catalog is available from Unistrut Products Co, 1013 W Washington Blvd, Chicago 7, Ill.

● Crane Rail Supports: Delta Star has prepared a bulletin on rail supports. This bulletin describes in detail the selection and design of these rail supports. In addition, standard rail designs are given, as well as data on bonding connectors for conductor rails. Delta Star Electric Co, 2437 Fulton St, Chicago 12, Ill.

Controlled Selling of a Controllable Load

THE TRUE STORY BEHIND *Glassheat*

TRADE MARK

BY CONTINENTAL

THE MOST ECONOMICAL HEAT BY ELECTRICITY

Whenever a product comes into general use that is so outstanding and remarkable that it threatens to revolutionize public opinion in regard to a daily household problem, it is bound to stir up some controversy. It is accordingly not surprising that in the tremendous amount of discussion relative to GLASSHEAT, some misconceptions have come to light — even into print.

Everyone should know these facts behind the GLASSHEAT story:

1. In installation after installation, verified reports show that GLASSHEAT by Continental, when operating in a properly insulated building, compares favorably costwise with any other good heating system.

2. GLASSHEAT meets the public demand for a better, healthier, more flexible heating system that can be installed at low cost and maintained indefinitely at practically no expense. *Continental will guarantee public satisfaction through engineered installation which will not be made until checked and approved by the local utilities.*

3. Continental Radiant Glass Heating Corporation, America's leading manufacturer of electric heating equipment, *cooperates* with utility companies in the *controlled* selling of GLASSHEAT units.

4. Controlled selling of GLASSHEAT installations means *higher utility profits, greater consumer benefits, and continued good customer relations.*

5. Continental has made thousands of new GLASSHEAT installations during 1951. The overall reaction of utility companies in the areas where these installations have been made has been not only favorable but enthusiastic.

The modern homeowner and businessman know about and are interested in buying GLASSHEAT. Certainly it is only fair that both the general public, and management of utility companies should know the full story, the true story, of what GLASSHEAT is, what it can do, and how much it costs.

CONTINENTAL RADIANT GLASS HEATING CORP.

1 East 35th Street

New York City, N. Y.

WITH AN

OSMOSE

INSPECTION AND TREATING PROGRAM

This program, performed by our highly skilled crews, can save your system hundreds of thousands of dollars in REPLACEMENT COSTS by

1. Absolutely arresting groundline decay of your poles and
2. Giving you up-to-date pole records.

Treatment charge is as low as 4% of replacement costs and pole life is extended for approximately 8-10 years. Let us send you ALL the details!

Write for Free Book

OSMOSE WOOD PRESERVING CO., INC.
1427 BAILEY AVE. BUFFALO 12, N. Y.

BOOK REVIEWS

Rectifiers

Stromrichteranlagen der Starkstromtechnik. **By H. Anschuetz. Published by Springer-Verlag, Berlin W 35. 213 pages, illustrated. Price DM 18.**

This is an introduction to the theory and European practice of applying rectifiers to "heavy-current" requirements. The phenomena are handled in mathematical form for most of the common connections of transformers and rectifiers up to 60 phase. Inverters are included as are the requisite protective measures.

Fuel Oil

Fuel Oil Manual. **By Paul F. Schmidt. Published by the Industrial Press, New York 13. 160 pages. Price $3.50.**

Users and purchasers of fuel oil occasionally wish they could acquire a better understanding of the extraction, refining and blending of that product. It opens with a simplification of the chemistry of petroleum and how oil is refined and graded. Gravity is differentiated from specific gravity and the heats of combustion explained. Treatment then takes up the physical properties such as viscosity, flash point and pour point as well as discussing the scope of impurities—water, sediment, carbon, sulfur. For the benefit of the operating man the cold weather troubles with oil are dealt with in a chapter on preheating. Stability, blending, storage and transportation are the subject matter of closing chapters. Without becoming deeply technical the book has the most-wanted quantitative information in each chapter.

Electromagnets

Design, Construction, and Operating Principles of Electromagnets for Attracting Non-ferrous Metals. **By L. R. Crow. Published by the Scientific Book Publishing Co, Vincennes, Ind. 38 pages, illustrated. Price $1.25.**

After an elementary discussion of electromagnetism the author shows qualitatively that it is possible for an ac electromagnet to be modified to attract copper, aluminum, or practically any conductive metal. The effect is achieved by inserting copper washers between an inner and outer core of the magnet.

Lighting Practice

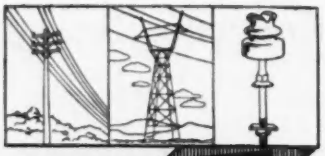
Introduction to Lighting. **By Howard M. Sharp. Published by Prentice-Hall, Inc, New York. 340 pages, illustrated. Price, $6.65.**

Written from the viewpoint of the practicing engineer, this book first makes clear the fundamental concepts of the lighting art and then shows how they are applied in practice. The content is suitable for a college course, or portions of it may be used in industry training programs. Problems based on actual situations are included along with extensive photometric data.

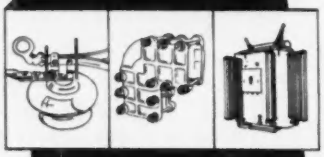
Circuits and Machines

Electrical Engineering. **By C. V. Christie. Published by McGraw-Hill Book Co, New York 18/36. 675 pages, illustrated. Price $7.**

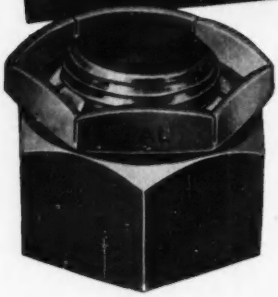
Professor Christie's text is now in the sixth edition. The latest retains the comprehensive content of the fifth and adds material on circuit theorems, amplidyne-type dc machines, typical speed controls for polyphase motors, and rectifiers. The book continues to be distinctive in being directed primarily to power circuits, systems and apparatus.



ABSOLUTE SECURITY
for
BOLTED ASSEMBLIES



PALNUT
TRADEMARK
LOCK NUTS



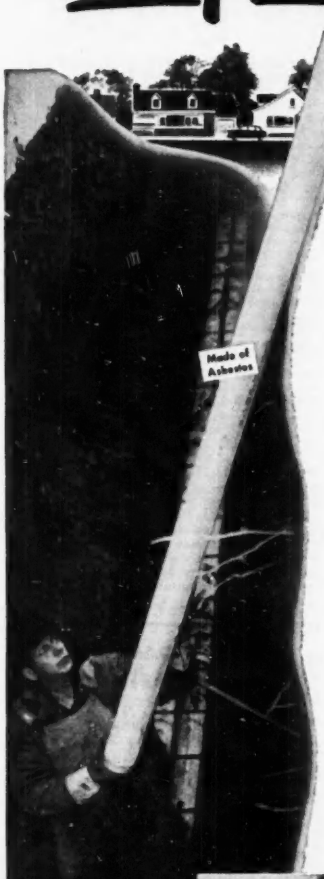
Apply a PALNUT Lock Nut on top of each ordinary nut you install and forget about loose bolts, assemblies and connections. Cost is negligible—application takes but seconds—protects for the life of installation. No further checking or re-tightening are needed. Perfect conductivity is assured.

PALNUT double-locking spring action prevents nut from loosening and bolt from back out. May be removed and re-used. Full range of sizes, in plain, Parkerized and Hot Dip Galvanized steel; also silicon bronze.

Samples and literature on request

The PALNUT Co.
51 CORDIER ST., IRVINGTON 11, N. J.

Easy to install...



That's why TRANSITE DUCTS save time, labor and money

THESE "ON THE JOB" photographs show why savings begin right at the start of the installation when you use Transite* Ducts.

The light weight of Transite Conduit and Korduct permits hauling a substantial footage of duct per truck. Handling is fast, too, because the asbestos-cement composition of Transite Ducts makes them strong and tough. The longer length of each duct . . . 10 feet . . . reduces the number of joints in the completed line. And joints are quickly made with the Transite Tapered Coupling that is engineered to stay tight in service.

For the full story of how Transite Ducts can reduce your cableway costs, write Johns-Manville, Box 290, New York 16, New York.

4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. Corrosion-Resistant. Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.

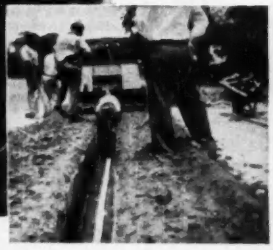
2. Permanently Smooth Bore. Transite makes long cable pulls easy. Danger of damage to cables is also minimized.

3. Incombustible. Transite will not burn nor contribute to formation of smoke, gases, or fumes . . . confines burn-outs and protects adjacent cables permanently.

4. Higher Thermal Conductivity. Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.

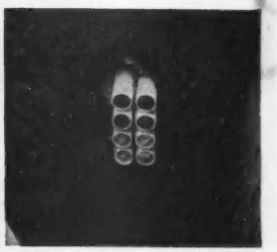
Easy to Handle: Working in a deep trench, this man finds that the light weight of Transite Ducts helps him work without undue strain.

*Reg. U. S. Pat. Off.



Speeds Installation: Transite Ducts are joined so rapidly that the assembly man can often follow right behind the trencher . . . as shown in this installation.

Speeds Distribution: The light weight of Transite Conduit enables the contractor to haul a large number of ducts per truck and speed distribution on job site.



Cuts Manhole Costs: Concrete will be poured directly around these Transite Ducts to form the manhole wall, a time and material saving made possible by Transite's strength.

Johns-Manville TRANSITE DUCTS

JM PRODUCTS

TRANSITE KORDUCT—for installation in concrete

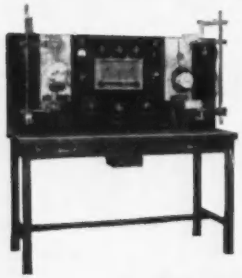
TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

SUPERIOR

SUPERIOR

Check with Superior on

PHOTO TEST TABLES



• Superior's new dual position, photo-electric test table . . . a great time and money saver...one of various standard Superior types. Superior also makes *any* type of special testing equipment to specification. Write to:

SUPERIOR SWITCHBOARD & DEVICES CO.

CANTON, OHIO

A subsidiary of The Union Metal Manufacturing Company

Machines

Electrische Maschinen; Band I. **By Rudolph Richter. Published by Verlag Birkhauser; Basel, Switzerland. 630 pages, illustrated. Price 49.4 Swiss francs.**

This is the dc volume in a second edition (first 1924) in direct reproduction with up-front listing of the corrections now effected.

High Frequency

High Frequency Transmission Lines. **By Willis Jackson. Published by John Wiley & Sons, Inc., New York 16. 152 pages, illustrated. Price $1.75.**

Standing waves are the bane of high frequency transmission engineers. Their avoidance and the refinement of efficient propagation and transmission are the subject matter of this little book. Microwave communication on power systems is growing. Those engaged will sense how far their techniques have taken them toward a field where wave-lengths are commensurate with circuit elements.

Isotopes

The Measurement of Radio Isotopes. **By Denis Taylor. Published by John Wiley & Sons, Inc., New York 16. 118 pages, illustrated. Price $1.50.**

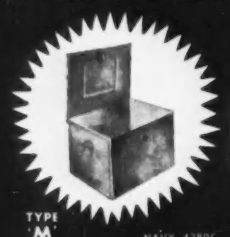
Britain's Harwell atomic research establishment is the source of this little book treating the detection and measurement of radioactivity, particularly in the field of the counting devices (like the Geiger-Mueller). It deals with the limitations to accuracy and the best ways of housing, mounting and applying the measurement devices.

Waveguides

Advanced Theory of Waveguides. **By L. Lewin. Published by Iliffe & Sons (British Book Centre, New York), 192 pages, illustrated. Price $6.75.**

A mathematical analysis of the problems in setting up waveguides for effective use of microwave energy is the content of this terse book. The microwave engineer will appreciate the comprehensive bibliography of international literature at the end of the book.

for NAVY SPARE-PARTS BOXES IN STRICT ACCORDANCE WITH SPEC. #JAN-B233



19 STOCK SIZES – AT PUBLISHED PRICES!

NOW available to you..... without costly sub-contracting problems

stock standard TYPE M, STEEL SPARE-PARTS BOXES, made in strict accordance with Navy Specifications.

To better service your need for Specification Spare-Parts Boxes (shipboard use), we have taken them from our "Special" department and put them on a mass production line. RESULT: they can now, in most cases, be shipped from stock.

SIMPLY ORDER THEM BY STOCK NUMBER

WRITE FOR SIZE AND PRICE CHART

DOLIN METAL PRODUCTS, INC.

321 LEXINGTON AVE. — BROOKLYN 16, N. Y.

FOR REDUCED MAINTENANCE COSTS

Subox & Subalox

Simplified Anti-Corrosive Paint Systems

Self priming and interchangeable, Subox & Subalox lend themselves to simplified and harmonious maintenance paint systems — since all varieties have one distinctive basic pigment, chemically active suboxide of lead (Pb_2O).

Subox paints provide maximum protection — are available in a range covering all phases of the electrical industry.

Subox Inc. Write for Full Information and System Data

HARRISON PLANT HACKENSACK, N. J.

BUY

all the U. S. Savings Bonds you can and

KEEP

all the U. S. Savings Bonds you buy

DOUBLE BARREL ADVERTISING

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

Direct Mail supplements your Display Advertising. It pin-points your message right to the executive you want to reach —the person who buys or influences the purchases.

In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low overall cost and the tested effectiveness of these hand-picked selections.

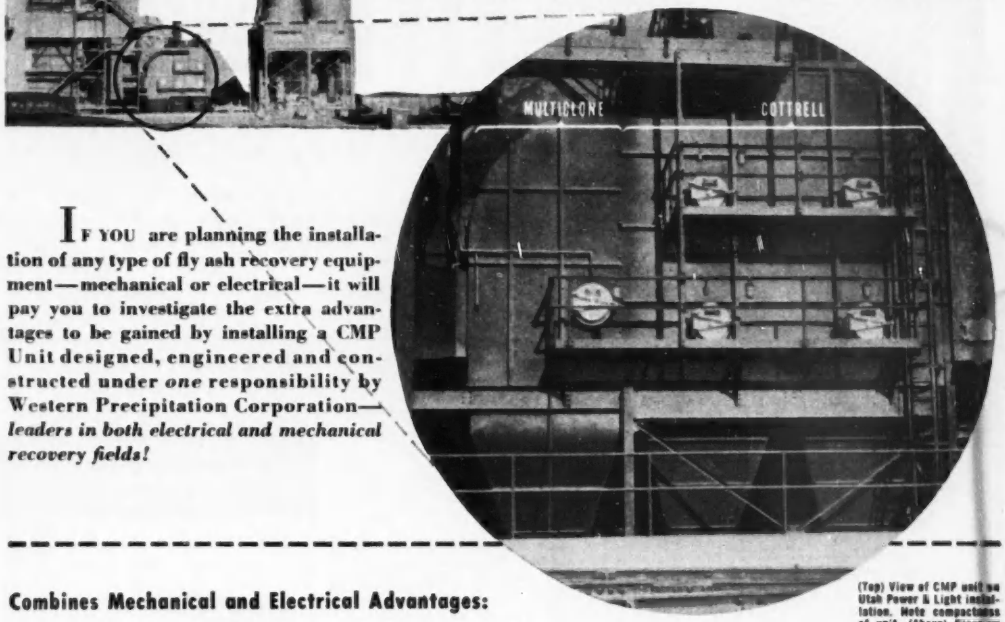
McGRAW-HILL DIRECT MAIL LIST SERVICE

McGraw-Hill Publishing Co., Inc.

330 West 42nd St., New York 18, N. Y.

Planning A Fly Ash Recovery Installation?

Consider these important advantages of a WESTERN PRECIPITATION CMP UNIT!



(Top) View of CMP unit on Utah Power & Light installation. Note compactness of unit. (Above) Close-up of same installation.

IF YOU are planning the installation of any type of fly ash recovery equipment—mechanical or electrical—it will pay you to investigate the extra advantages to be gained by installing a CMP Unit designed, engineered and constructed under *one* responsibility by Western Precipitation Corporation—*leaders in both electrical and mechanical recovery fields!*

Combines Mechanical and Electrical Advantages:

A CMP (Combination Multiclone-Cottrell Precipitator) Unit combines—in one compact installation—both mechanical and electrical recovery principles, so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally cleans the gases of the larger and heavier fly ash particles (down to a few microns in diameter) . . . and the COTTRELL Precipitator then electrically removes the very small particles remaining in the gases. This combination arrangement has important advantages:

1. Using the MULTICLONE for cleaning out the heavier particles permits the bulk of the recovery operation to be performed with relatively low-cost equipment.

2. Using the COTTRELL for final clean-up insures unusually high recovery efficiency—approaching theoretically perfect, if desired—with a high efficiency, compact Precipitator unit.

3. Each type of unit—MULTICLONE and COTTRELL—can be arranged for its most efficient application. MULTICLONES may be connected to each separate boiler, if desired, and their draft requirement cut out when the boiler is down . . . while a central COTTRELL handles all gases and operates at higher efficiencies, with continued low power cost, when one or more boilers are down.

4. During soot-blowing periods, or while warming up cold boilers, the MULTICLONE efficiency usually increases, preventing overloads of detrimental carbon from reaching the COTTRELL.

Only Western Precipitation Combines Multiclone and Cottrell "Know-How"—In ONE Organization!

A vital factor in obtaining maximum efficiency and economy in CMP installations is the proper balance of mechanical and electrical recovery equipment to the individual requirements of *each* application. Western Precipitation is unique in that it not only pioneered the commercial application of COTTRELL Electrical Precipitators over 43 years ago, but also has been a leader for many years in the *mechanical* recovery field with its widely-recognized MULTICLONE Collectors.

Result—Western Precipitation has the all-important "know-how" and experience in BOTH fields . . . knows from first-hand experience how to fit the *right* equipment in the *right* place, to do *your particular* job . . . and can provide the complete installation under ONE responsibility and ONE overall guarantee!

Let Our Experienced Engineers study your recovery requirements and make recommendations on the equipment best suited to your operations. A wire, phone call or letter to our nearest office places this unique "Know-How" at your service, without obligation!

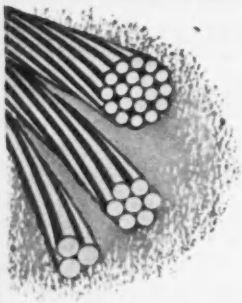
Send for descriptive literature!

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1054 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. LaSALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

PAGE



Stainless Steel
STRAND
AND
Stainless-Copper
CONDUCTORS

Here's WHY they Save

Compared with other types strand of equal breaking strength, they . . .

- have 30-40% greater overload capacity within elastic limit.
- resist corrosion all the way through—not merely through a thin case of soft metal.
- offer highest tensile and vibration-fatigue strength (tensile strength 235,000 psi; corrosion-fatigue limit 50% of ultimate).

Here's HOW they Save

- They permit longer spans—therefore require fewer poles per mile.
- Being lighter, they are easier and faster to install in the field.
- More resistant to destructive factors, they last many times as long before replacement.

Let us tell you the whole story—

specific data, prices, recommended sizes.

ACSR

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TECHNICAL LITERATURE

Power Factor—*A Power Factor Visualizer* (SA-6739), a slide rule type chart, explains what low power factor means to the power user and power supplier. The advantages of capacitor installations on distribution systems are explained. Other benefits of capacitors, as decreased transformer losses, improved motor protection, and reduced line losses are explained. Write Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Printed Circuits—Two semi-automatic machines for printing electronic circuits on either flat or cylindrical surfaces have recently been developed. The new machines are faster than hand printers and more economical for quantity production. In addition, they give a more uniform product. For a report on these printers, write for *Technical Report 1548* to National Bureau of Standards, U. S. Dept of Commerce, Washington 25, D. C.

Tubing Steel—A data card, *TDC 102*, presents technical information for engineers associated with equipment operating at elevated temperatures and pressures. Creep stress data are given for rates of 1% elongation in 10,000 and 100,000 hours at 800F to 1500F for 16 popular carbon, intermediate alloy, and stainless steels. Write Babcock & Wilcox Tube Co, Beaver Falls, Pa.

Standards—NEMA has recently released standards for *Brushes for Electrical Machines*, No. CB 1-1951, and *Standards on Purchase Specifications for Marine-propulsion Steam Turbines and Gears*, No. MP 5-1951. Bothe publications are listed at $1.50 per copy and are available from NEMA, 155 East 44 St, New York 17, N. Y.

Circuit Breaker Panelboards—A new 20-page booklet, B-5620, describing circuit breaker panelboards for lighting, power, and appliance circuits has recently been released. Circuit breakers for a complete line of industrial and commercial requirements are discussed. Write Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Rubber Specifications—*Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications* has been prepared by the American Society for Testing Materials. These specifications establish a means of classifying and describing the many rubber and synthetic rubber compounds in use today. Specifications are of value to not only purchasers of automotive rubber parts but also for purchasers that specify rubber requirements in physical properties. Available for 40¢ from ASTM, 1916 Race St, Philadelphia 3, Pa.

Welding Nickel—*Technical Bulletin T-33* has been released by the International Nickel Co, Inc, and describes resistance welding of nickel and high nickel alloys. It contains 33 pages of drawings and illustrations and also tables of mechanical properties, chemical compositions, and recommended conditions for welding. Write Inco Development and Research Division, 67 Wall St, New York 5, N. Y.

Copper Corrosion—*Corrosion Resistance of Copper and Copper Alloys*, a 24-page booklet, explains the chemical and physical nature of corrosive action in its various forms. A tabulation is included describing the relative corrosion resistance of principal types of copper and copper base alloys when in contact with 183 different types of corroding agents. Publication B-36 is available from American Brass Co, Waterbury 20, Conn.

Air Pollution Detector—Detection of air pollution is described in folder ND 46-91(1). The use of the new Autometer equipment and Speedmax Recorder to de-

EISLER

TRANSFORMERS
STANDARD • SPECIAL
AIR • OIL • WATER COOLED

POWER, LIGHTING, HEATING, WELDING, ELECTRIC FURNACE PHASE CHANGING, ETC.

EISLER Transformers are built strictly to N. E. M. A., A. S. A. and A. I. E. E. standards.

½ TO 500 KVA • UP TO 15,000 V.

SEND FOR NEW CATALOG NO. TR-50

CHAS. EISLER
EISLER ENGINEERING CO., Inc.
751 SOUTH 13th ST. NEWARK 3 N. J. U. S. A.

PRESSITE.
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.

ELECTRITE
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.

DENSITE
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace more expensive types of insulating materials.

Pulp Products Department

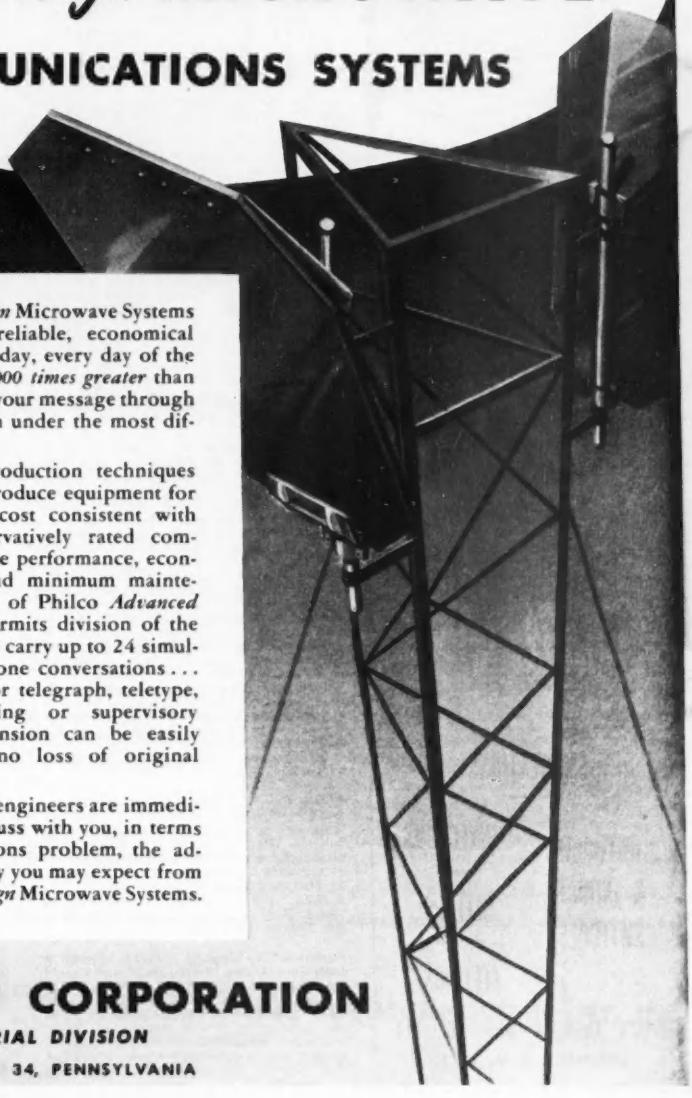
WEST VIRGINIA
PULP AND PAPER COMPANY
230 Park Avenue New York 17, N. Y.
35 E. Wacker Drive Chicago 1, Ill.

Don't Settle for Less Than . . .

PHILCO

Advanced Design MICROWAVE

COMMUNICATIONS SYSTEMS



Philco *Advanced Design* Microwave Systems are engineered for reliable, economical operation 24 hours a day, every day of the year. A signal level *1000 times greater* than normally needed gets your message through clear and strong, even under the most difficult conditions.

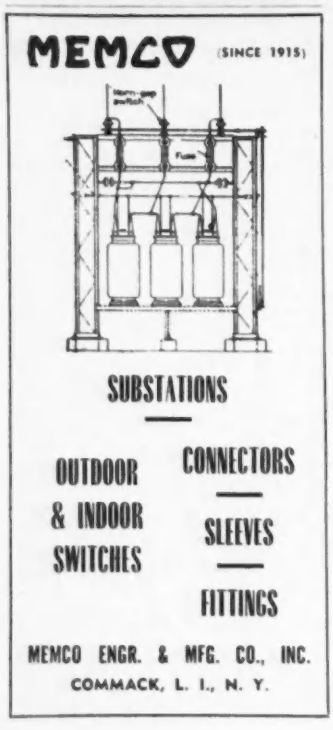
Philco's exclusive production techniques make it possible to produce equipment for the lowest possible cost consistent with high quality. Conservatively rated components insure reliable performance, economy of operation and minimum maintenance. The flexibility of Philco *Advanced Design* Microwave permits division of the broadband channel to carry up to 24 simultaneous 2-way telephone conversations . . . or further division for telegraph, teletype, telemetering, signaling or supervisory circuits. Future expansion can be easily accomplished with no loss of original investment.

Philco regional sales engineers are immediately available to discuss with you, in terms of *your* communications problem, the advantages and economy you may expect from Philco *Advanced Design* Microwave Systems.

PHILCO CORPORATION

INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA



tect from 0 to 5 parts of sulphur dioxide per million parts of air is depicted complete with flow diagrams, etc. A complete list of equipment and specifications is included. Leeds and Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

Guidance Manual—ECPD has issued a new manual for engineers aiding young men interested in the engineering profession. The 15-page pamphlet urges members of engineering societies to establish guidance committees to aid high school pupils to determine if they have aptitude for following the engineering profession. The manual is available for 20¢ from ECPD, 29 West 39 St, New York, N. Y.

Jet Condensers—*Standards for Barometric and Low Level Jet Condensers*, recently released, covers nomenclature, definitions, and standards for condenser performance, vacuum pump capacity, installation, information on atmospheric relief valves and in addition handy conversion tables. This publication may be purchased for $1.00 from Heat Exchange Institute, 122 East 42 St New York 17, N. Y.

School Lighting—Two new booklets, *Day-Brite lights the way . . . for students . . . across the U.S.A.* and *It Happened in Denver Schools . . . it can happen in yours*, describe the advantages of having proper and adequate lighting for school buildings. The booklets are profusely illustrated. Prepared by Day-Brite Lighting, Inc, 5411 Bulwer Ave, St. Louis 7, Mo.

V-Belt Drives—*Engineering Standards for Multiple V-Belt Drives*, 16-page bulletin, has been prepared. Manual indicates proper sheaves and belts to be used for optimum efficiency and economy of complete drive for a particular application. Tables of groove dimensions for V-Belt sheaves, prime mover characteristics, and suggested service factors for electric motors and fuel engines in many applications plus other tables are included. Standards available from Rubber Manufacturers Assoc, Inc, 444 Madison Ave, New York 22, N. Y. at $1.00.

Steel Finish—How to obtain a finish on steel acceptable to Government Specification JAN—C—490 is explained in publication. Ordnance applications, notes on the spray, dip, or brush processes, heat requirements, coating time, etc. are discussed. Published by American Chemical Paint Co, Ambler, Pa.

Home Wiring Handbook—Third edition of this 135-page guide contains both *code* requirements as to safety, and functional requirements that permit full use of present or future equipment. Musts in electrical equipment for the home, plus further refinements for better electrical living are set forth. Every phase of house wiring, including outlet requirements, selection of number and type of circuits, circuit protection, and communication systems are presented. Wiring Handbook, B-3510-B, is available for $1.00 from Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Visual Control—More efficient visual control of production, scheduling, engineering, inventory, etc. are presented in 4-page bulletin. How visual control boards may be used to visualize operating effectiveness at a glance at any time of day is shown. Typical applications are given as examples. Bulletin 159-3 available from Visi-Trol Corp, 21460 West Eight Mile Rd, Detroit 19, Mich.

Furnaces—A 12-page bulletin complete with illustrations, design data, and charts describes tangential firing and superheat control with a C-E adjustable furnace. Some topics discussed are: influence of coal quality on design, tangential firing, and burner modifications for slag tap furnaces. Copies available from Fairmont Coal Bureau, 122 E 42nd St, New York 17, New York.

The *Original Prod-Mount Voltage Tester* is the KNOPP

Patents Pending

Say "Goodbye to risky, time-wasting fuss in testing" with the 5 main safety features in the KNOPP Voltage Tester: (1) original Prod-mounting Socket in housing making this tester easier, faster, and safer to use and ending time-wasting "three-handed" testing; (2) protection through Dual indication of voltage by solenoid and neon lamp working independently; (3) positive volts readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well-built and shock proof in a LAMINATED bakelite housing, this KNOPP Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles—for testing old and new circuits, fuses, locating grounds, etc.

Get the widely-used and reliable KNOPP Voltage Tester with the time-proved Prod-Mount, and other safety features from your dealer, or write for illustrated free, new descriptive Bulletin No. 425.

ELECTRICAL FACILITIES INC.

4236 Holden Street Oakland 8, Calif.

WANTED

MORE IRON AND STEEL SCRAP . . . OF ALL KINDS!

Steel mills and foundries need more scrap.

Not just "production" scrap from metal-fabricating plants . . . but also all sorts of *idle* iron and steel—from all types of plants.

Search *your* plant for this idle metal . . . work with your local scrap dealer to increase supplies of badly-needed iron and steel scrap.

What to look for . . .

obsolete machines, tools and equipment, no-longer-used jigs and fixtures, worn-out or broken chains, wheels, pulleys, gears, pipe, tanks, drums and abandoned metal structures. Non-ferrous is needed, too!

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET • NEW YORK 18, N.Y.

How Can America Produce All the Steel It Needs ... for Military... and Civilian Purposes?

FREE BOOKLET Tells How to Conduct Scrap Salvage Program in *Your* Business.

Address Advertising Council, 25 W. 45th St., New York 19, N. Y.

One way is to feed more pig iron into the furnaces. But . . .

That will require *more* supplies of ore, limestone, coal, etc.*—to say nothing of more new ore boats and rail cars to transport the additional supplies.

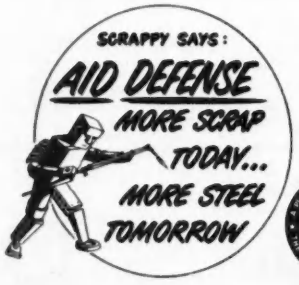
A better way—the *only* practical way—is to use the *dormant* iron and steel scrap lying around in the form of old machines, equipment, tools and metal structures.

Your business *must* have available scrap—in *some* form. That scrap is *needed* to keep the furnaces going in the steel mills . . . to keep our fighting forces and our allies well armed . . . to sustain our civilian life at home.

Think how many ways *you* use iron and steel. Think what would happen if it became extremely scarce. Put your iron and steel scrap to good use—now—by selling it to your local scrap dealer.

Don't delay—the emergency is becoming more severe every day.

*For every ton of scrap fed into the furnaces, we save approximately 2 tons of iron ore, 1 ton of coal, nearly ½ ton of limestone and many other critical materials. Also, scrap helps make steel faster, shortens the refining process.



NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

McGRAW-HILL PUBLISHING COMPANY, INC.
330 WEST 42nd STREET NEW YORK 18, N.Y.

"Some 15,000 employees in all branches of our organization are taking advantage of the Payroll Savings Plan..."

SPENCER LOVE
Chairman of the Board, Burlington Mills

"The Payroll Savings Plan is one of the important personnel services offered to the employees of our company. At the present time some 15,000 employees in all branches of our organization are taking advantage of this splendid plan for systematic savings. In times of national emergency this plan assists in stabilizing the economic life of the employee, the community and the nation."

Last call for the 1951 Defense Bond Campaign!

While the campaign was scheduled for six weeks, beginning Labor Day, the *accounting period* will include all Payroll Savings Plan bond purchases and enrollments in September *and October*.

If *you* haven't conducted a person-to-person canvass to put a Payroll Savings Blank in the hands of every man and woman in *your* company there is still time to join the thousands of companies which have added nearly a million employees to the Payroll Savings Plan through person-to-person canvasses.

Phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will give you all the help you need—application blanks, posters, envelope stuffers, personal assistance.

Give your employees an opportunity to save for their future and at the same time, help to maintain America's economic security—put an application blank in their hands.

Results of a few recent person-to-person canvasses

Firestone Tire and Rubber Company (40,000 employees), 87% participation; Universal Atlas Cement Company, 67.8% of 4,789 employees . . . Martha Mills, 71% of 2,200 employees . . . Lit Brothers, 52% of 3,600 employees . . . Delta Air Lines, 65% of 2,100 employees; Aerojet Engineering Corporation, 78.1% of 2,000 employees . . . Brown-Lipe Chapin Division of General Motors, 87% of 1,750 employees; Fabricast Division, General Motors, 85% of 1,700 employees.

Person-to-person canvasses now under way include:

	Number of Employees
38 Major Railroads	993,142
Radio Corporation of America	40,000
Owens-Illinois Glass Company	25,000
Cudahy Packing Company	17,000
Pacific Gas and Electric	17,000
Willys-Overland	6,750
Owens-Corning Fiberglas Corp.	6,500
White Motor Company	6,500
Fruehauf Trailer Company	5,700

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

ELECTRICAL WORLD

Advertising In This Issue

Advertising Council, Inc. 245
Allis-Chalmers Mfg. Co. ..... Second Cover
20, 21, 73, 74
75, 76, 93
American Blower Corp. 55, 56
American Brass Co., The 77
American Bridge Co. 235
American Creosoting Co. 101
American Steel & Wire Co. 88, 89
Anaconda Wire & Cable Co. 84, 85
227
Anderson Brass Works, Inc. 180
Automatic Switch Co. 232

Babcock & Wilcox Co. 80, 81
Bailey Meter Co. 216, 217
Baltimore & Ohio Railroad 22
Bartlett Mfg. Co. 209
Bentley, Harris Mfg. Co. 54
Biddle Co., James G. 23
Blackburn Corp., Jasper 189
Brewer-Titchener Corp. 68, 69
Brown Co. 178
Brown-Boveri Corp. 223
Buckingham Mfg. Co., Inc. 230
Buell Engineering Co., Inc. 231
Burndy Engineering Co. 31

Cardox Corp. 202
Chase Brass & Copper Co. 96
Chase-Shawmut Co., The 177
Coal Chemical Sales Div. U. S. Steel 60
Cochrane Corp. 43
Combustion Engineering-Super-Heater Inc. 24, 25
Commonwealth Associates, Inc. 224
Commonwealth Services, Inc. 224
Consolidated Treating Co. 62
Continental Radiant Glass Heating Corp. 237
Control Corp. 220
Cope Inc., T. J. 35
Copperweld Steel Co. 67
Corning Glass Works 57
C-O-Two Fire Equipment Co. 204
Crouse-Hinds Co. 86, 87

De Laval Separator Co., The 104
Diamond Power Specialty Corp. 191
Directory of Engineers 248
Dolin Metal Products, Inc. 240
Driver-Harris Co. 181

Ebasco Services, Inc. 38
Eisler Engineering Co., Inc. 242
Electrical Engineers Equipment Co. 213
Electrical Facilities, Inc. 244
Electrical Testing Laboratories, Inc. 229
Electroline Company 5
Engineers, Directory of 248

Fargo Mfg. Co., Inc. 203
Federal Electric Prdoucts Co. ..... Third Cover
Ferranti Electric, Inc. 236
Fisher-Pierce Co., Inc., The 210
Foster Wheeler Corp. 50, 51

Gai-Tronics Corp. 45
General Cable Corp. 36, 37, 200, 201
General Electric Co.
Apparatus Dept. 32, 33, 102, 157
158, 159, 161, 162, 163, 165
Green Fuel Economizer Co., The 228
Grinnell Co., Inc. 70
Gulf Oil Corp. 49

Haartz-Mason, Inc. 30
Hazard Insulated Wire Works 78, 79
244
Hi-Voltage Equipment Co. 196, 197
Holan Corp., The J. H. 106
Holophane Company, Inc. 221
Hoosier Engineering Co. 53
Hotpoint, Inc. 98
Hubbard & Co. 193

Illinois Electric Porcelain Co. 190
Indiana Steel & Wire Co. 198
Ingersoll-Rand 99
International Business Machines 46
I-T-E Circuit Breaker Co. 10, 11
12, 13

Johns-Manville 234, 239
Joslyn Mfg. & Supply Co. 205

Kellogg Co., The M. W. 179
Kerite Co., The 108
Kidde & Co., Inc., Walter 100
Koppers Co., Inc. 222
Kuhlman Electric Co. ..... Fourth Cover

Lapp Insulator Co., Inc. 211
Line Material Co. 39, 40, 41
Locke Dept., General Electric Co. 94

Mahon Co., R. G. 66
Mallory & Co., Inc., P. R. 4
McCabe-Powers Auto Body Co. 58
McGraw-Hill Book Co., Inc. 249
Memco Engr. & Mfg. Co., Inc. 244
Minneapolis-Honeywell Regulator Co., Industrial Div. 170, 171
Moloney Electric Co. 187
Murray Mfg. Co., D. J. 232

National Telephone Supply Co. 34
National Varnished Products Corp., The 183
Neils Lumber Co., J. 214
Nordberg Mfg. Co. 97

Ohio Brass Co. 173, 174, 175, 176
Okonite Co., The 78, 79, 244
Osmose Wood Preserving Co., Inc. 234
O. Z. Electrical Mfg. Co., Inc. 64

Pacific Electric Mfg. Corp. 59
Page Steel & Wire Div., American Chain Co. 242
Palnut Co., The 238
Pennsylvania Transformer Co. 28, 29
Philadelphia Gear Works, Inc. 93
Philco Corp., Industrial Div. 243
Porcelain Insulator Corp. 169
Porcelain Products, Inc. 61
Preformed Line Products Co. 18, 19

Pritchard & Co., J. F. 215
Pyle-National Co., The 44

Radio Corp. of America Engineering Products Dept. 194
Railway & Industrial Engineering Co. 105
Reliable Electric Co. 47
Revere Copper & Brass, Inc. 167
Riley Stoker Corp. 16, 17
Roebling's Sons Co., John A. 65
Roller-Smith Corp. 63
Rome Cable Corp. 14, 15
Rural Transformer & Equipment Co. 236

S & C Electric Co. 6, 7
Sangamo Electric Co. 208
Searchlight Section 250, 251
Silent Hoist & Crane Co. 188
Simplex Wire & Cable Co. 72
Smith Co., S. Morgan 199
Sorg Printing Co., Inc., The 212
Southern Electrical Corp. 185
Southern States Equipment Corp. 92
Standard Transformer Co. 42
Stonco Electric Products Co. 238
Subox, Inc. 240
Superior Switchboard & Devices Co. 240

Thomas & Sons Co., R. 26, 27

United States Rubber Co. 218
United States Steel Corp. 60, 88, 89
103, 235
Utility Pole Co. 195

Victor Insulators, Inc. 8, 9

Wagner Electric Corp. 206, 207
Weaver Co., J. A. 52
West Virginia Pulp & Paper Co. 242
Western Precipitation Corp. 241
Westinghouse Electric Corp. 48, 71
82, 83, 90, 91, 107
Weston Electrical Instrument Corp. 233
Worthington Pump & Machinery Corp., Engine Div. 225

■

PROFESSIONAL SERVICES 248

■

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. HILTY, Manager

EMPLOYMENT
Positions Vacant 250
Selling Opportunities Offered 250
Employment Services 250
SPECIAL SERVICES
Rebuilding 251
EQUIPMENT
(Used or Surplus New)
For Sale 250, 251
WANTED
Equipment 250

PROFESSIONAL SERVICES

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
30 State Street, Albany, N. Y.

HARZA ENGINEERING CO.

Consulting Engineers

L. F. HARZA
E. MONTFORD FUCIK CALVIN V. DAVIS
Hydro-Electric Power Projects
Transmission Lines, System Management, Dams, Foundations, Harbor Structures, Soil Mechanics

400 W. Madison St. Chicago 6, Ill.

ARTHUR L. MULLERGREN

Engineering-Management

Public—Utilities—Natural Gas

Kansas City, Mo.

BLACK & VEATCH

Consulting Engineers

Electricity—Water—Sewage—Industry

Reports, Design, Supervision of Construction, Investigations, Valuation and Rates

4706 Broadway Kansas City 2, Missouri

HOOSIER ENGINEERING COMPANY

Erecting Engineers
Transmission Lines, Substations

1384 Holly Avenue, Columbus, Ohio
327 South LaSalle Street, Chicago, Ill.
136 Liberty St., New York

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing . .
Specialists in Financing
Accounting and Other Operations

231 So. La Salle St. Chicago 4

DAY & ZIMMERMAN, INC.

Engineers

Design - Construction - Management
Investigations and Reports

New York Philadelphia Chicago

JACKSON & MORELAND

Engineers and Consultants

Design and Supervision of Construction
Reports — Examinations — Appraisals
Machine Design — Technical Publications

Boston New York

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES
THE ONE-STEP METHOD

Bill Frequency Analyzer

100 Sixth Ave. WOrth 4-8328 New York 13, N. Y.

Doble Engineering Company

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation. Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. Chicago, Ill.

THE KULJIAN CORPORATION

Engineers • Constructors

1200 North Broad St., Philadelphia 21, Pa.
Washington, D. C.; Rome, Italy;
Calcutta, India; Caracas, Venezuela;
Mexico City, Mexico

REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

38 Vesey Street, New York 7, N. Y.

Ebasco Services Incorporated

Engineers - Constructors - Business Consultants

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering

Two Rector Street New York
Chicago • Washington, D. C.

LARAMORE and DOUGLASS, INC.

Consulting Engineers

Power Plants
Transmission Distribution
Design — Reports — Appraisals — Rates

79 East Adams Street
Chicago 3, Illinois

SANDERSON & PORTER

Engineers and Constructors

New York • Chicago • San Francisco

ELECTRICAL TESTING LABORATORIES, INC.

Laboratory Factory and Field Investigations
Inspections and Associated Services
Certification

2 East End Avenue at 79th St., New York 21, N. Y.

N. A. LOUGEE & COMPANY

Engineers and Consultants

REPORTS — APPRAISALS
DEPRECIATION STUDIES — RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway New York

SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Design—Surveys—Appraisals
Construction & Maintenance

Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

48 Griswold St. Binghamton, N. Y.

LUCAS & LUICK

Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

F. W. SCHEIDENHELM

Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

50 Church Street, New York 7, N. Y.

FORD, BACON & DAVIS

Engineers

DESIGN . CONSTRUCTION
VALUATIONS . REPORTS

New York . Philadelphia . Chicago . Los Angeles

LUTZ & MAY

Consulting Engineers

STEAM, GAS & DIESEL POWER STATIONS
PUMPING PLANTS—ELECTRIC SYSTEMS
REPORTS—DESIGN—APPRAISALS

1009 Baltimore Kansas City 6, Mo.

F. A. TUCKER, INC.

Contractors—Engineers

specialize in
Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office—38½ Center Street, Rutland, Vt.
Branch Office—120 East 3rd St., Charlotte, N. C.

GILBERT ASSOCIATES, Inc.

Engineers and Consultants

DESIGN AND SUPERVISION OF STEAM, HYDRO, WATER SUPPLY, SEWAGE DISPOSAL AND DIESEL PLANTS
Reports . Rates . Labor Relations . Safety
Purchasing . Costs . Laboratory

New York Reading, Pa. Washington
Houston Philadelphia

CHAS. T. MAIN, INC.

Engineers

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals

Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission-Distribution
Electric and Telephone Lines
Consultants

501 York Road, Jenkintown, Pa.

W. C. GILMAN & COMPANY

Consulting Engineers

Load and Capacity Studies — Rate Cases
Financial Planning
Investigations — Reports — Supervision

35 Liberty Street New York 5

MIDDLE WEST SERVICE CO.

Practical and Experienced Consultants

20 N. Wacker Drive Chicago

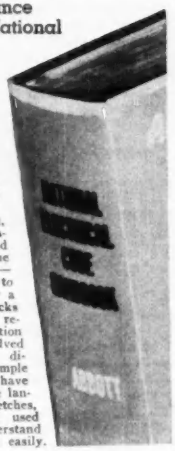
THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

How to handle
all types of
wiring and installation jobs

in strict accordance with the 1951 National Electrical Code



HERE is the electrical contractor's job book completely revised to conform with the 1951 Code requirements and planned to enable electricians to understand and do work in accordance with the National Electrical Code.

In Abbott's Handbook, you will find explanations of the rules and measurements for the various types of jobs—what they mean—how to apply them. Wherever a ruling in the Code lacks clarity, it is carefully reviewed and its application explained. More involved paragraphs have been divided into short and simple rules, and many rules have been restated in simple language. Diagrams, sketches, and illustrations are used freely to help you understand the rules quickly and easily.

Just Out—New 3rd Ed.

National Electrical Code Handbook

By Arthur L. Abbott

652 pages, 5 x 7½, semi-flexible binding, 441 illustrations, $6.00

Partial list of Contents —

- approved types of wiring
- cable assemblies
- requirements applying to all raceways
- outlet, switch, and junction boxes
- electrical appliances
- grounding
- outside wiring
- overcurrent protection
- communication systems
- elevators

This is an unusually practical book, especially planned for quick reference use by practical men. It gives rules and requirements for all jobs in accordance with the latest National Electrical Code. *All the rules for a job are in one place.* With this Handbook to help you, you cannot miss a single rule and you cannot fail to understand all the rules. Includes everything from special requirements pertaining to hazardous locations to complete tables giving the full-load current, wire size, conduit size, and branch fuse rating of various types of motors. Contains a Key to the Code on the covers and fly leaf.

10 DAYS' FREE EXAMINATION

McGRAW-HILL BOOK CO.,
330 W. 42nd St., NYC 36

Send me Abbott's NATIONAL ELECTRICAL CODE HANDBOOK for 10 days' examination on approval. In 10 days I will remit $6.00, plus few cents for delivery, or return book postpaid. (We pay delivery if you remit with coupon; same return privilege.)

(print)
Name .....

Address .....

City ..... Zone..... State.....

Company .....

Position EW-1-28-52

This offer applies to U. S. only.

Double Barrel Advertising

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

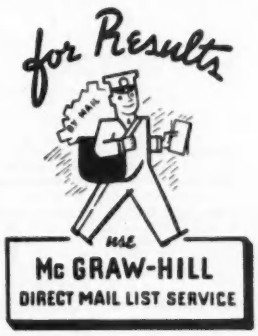
Direct Mail supplements your display advertising. It pinpoints your message right to the executive you want to reach—the person who buys or influences the purchases.

More and more companies are constantly increasing their use of Direct Mail because it does a job that no other form of advertising will do.

McGraw-Hill has a special Direct Mail Service that permits the use of McGraw-Hill lists for mailings. Our names give complete coverage in all the industries served by McGraw-Hill publications—gives your message the undivided personal attention of the topnotch executives in the industrial firms. They put you in direct touch with the men who make policy decisions.

Some people have a wrong conception of Direct Mail. There's no hocus-pocus to it—there's no secret formula—nor is there need for an extensive department to plan and execute your mailing program. You don't even need your own mailing lists.

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance in industrial personnel. Our lists are compiled from exclusive sources, based on hundreds of thousands of mail questionnaires and the reports of a nationwide field staff, and are maintained on a twenty-four hour basis.



In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low overall cost and the tested effectiveness of these hand-picked selections.

McGRAW-HILL PUBLISHING CO., INC.
330 WEST 42nd STREET, NEW YORK 18, N. Y.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, $1.20 a line an insertion.

INFORMATION:

BOX NUMBERS count as 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is $11.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by Feb. 1st in the N. Y. C. office will appear in the Feb. 11th issue subject to limitation of space available.

WANTED: Experienced Power Station Engineer
POSITION: Assistant to Manager of Power Production with administrative responsibility of operating central stations totalling approximately 800,000 kw.
LOCATION: Pennsylvania.
ADVANCEMENT: Excellent for growth on job and promotion in near future.
EXPERIENCE: 10 years minimum, with at least 5 years in operation, maintenance or efficiency work in large modern steam-electric central station. Construction and design experience will be considered.
EDUCATION: B.S. degree in Mechanical (preferred) or Electrical Engineering from an accredited engineering college.
AGE: 30-45.

Salary commensurate with qualifications

All applications will be acknowledged. Please send personal record to

P-2130, Electrical World
330 W. 42 St., New York 36, N. Y.

MANUFACTURERS REPRESENTATIVES

New Electrical Connector Manufacturer seeks representatives now handling related equipment lines. Connectors particularly suitable for use with aluminum conductor.

RW-3112, Electrical World
330 W. 42 St., New York 36, N. Y.

ELECTRICAL FIELD ENGINEERS

Experienced in Construction of Power Stations and High Voltage Substations required by established consulting engineers. Location—Middle West.

P-2904, Electrical World
520 No. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER

Required by well known Consulting Firm for Design of Power Stations and Substations. Familiarity with control board and relay applications desirable. Good opportunity for graduate with 5 to 10 years experience.

LOCATION - CHICAGO

P-2906, Electrical World
520 No. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEER

As Assistant Superintendent for Midwest Municipal electric and water utility. Experience in design, planning and operation of 2400/4160 volt distribution systems. Knowledge and experience in steam generating plants desirable. Age 32-40 years.

P-2881, Electrical World
330 W. 42 St., New York 36, N. Y.

WANTED

Field Sales Engineer with good general knowledge of Pole Line Hardware. Territory—Ohio, Western Pennsylvania, West Virginia, and Western Maryland and Western Virginia. Car required.

Submit resume giving all detail.

SW-3102, Electrical World
330 W. 42 St., New York 36, N. Y.

WANTED
SALESMAN or AGENCY

Experienced in sale of power and distribution transformers for Chicago district

SW-1778, Electrical World
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ELECTRICAL ENGINEER—Position open in Eastern United States for young man with actual experience in distribution and electrical maintenance work. Take off and estimating experience helpful. Excellent opportunity for advancement. This position is permanent. Send record of experience and education and references with application. Salary open. P-2910, Electrical World.

MANAGER COMBINATION Utility — predominantly electric, administrative and sales ability important, technical background desirable. Permanent position and substantial opportunity for qualified person. Replies confidential. Submit complete details including salary requirements. P-2466, Electrical World.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

MOTORS

We offer for sale 83 new motors manufactured by the Leland Electric Co., from ½ to 5 H.P. in standard voltages, cycles, and RPM. These are priced for sale at a sacrifice. Please send for list and prices.

FS-3104, Electrical World
330 W. 42 St., New York 36, N. Y.

WANTED

BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES

No lengths too long or too short

Telephone: Eastgate 7-4778

PIERCE CABLE CO.
2670 Clybourne Ave. Chicago 14, Illinois

WANTED FOR CASH

ELECTRIC MOTORS — STARTERS
TRANSFORMERS — OIL & AIR BRKRS.
WIRE — CABLE — WIRING MATERIALS
SEND LISTINGS

ALLIED ELECTRIC & MACHINERY CO.
1007 Falls Bldg., P. O. Box 1638
Memphis, 1, Tenn.

FOR SALE

HYDRAULIC TURBO-GENERATOR —VERTICAL

Westinghouse AC Generator 1400 Type EV Vertical, 312 KVA, 3 phase, 60 cycles, 250 volts, 80% P.F. 720 amps, 600 RPM, EXC amps 56, EXC volts 125, serial no. 4977759.

direct connected to and driven by

S. Morgan Smith—Hydraulic Turbine, Adjustable blade Unit—29 ft. head—Drawing number 4359-A-1—Complete with Woodward Governor type AR 3000, number 6280. Installed new 1929, completely overhauled 1945 and used as standby since. In excellent condition.

This equipment includes such auxiliary apparatus as switch board, metering—can be seen in operation—Immediate delivery.

PLASTOID CORP.
42-61-24th Street L. I. C., N. Y.

FOR SALE immediate delivery

300 K.W. G.E. synchronous motor generator set.
10 ton 220 Volt a.c. Overhead crane 40 ft. span with 200 ft. A frame outdoor runway.
25 ton ditto 60 ft. span.
6 ton Shepherd Niles for ice plant.
3 ton 220 D.C. crane.

H. A. WOODWORTH ENG. CO.
D 19 Railway Exch. Bldg. St. Louis 1, Mo.

REBUILT AND NEW

GUARANTEED MOTORS
M.G. SETS • GENERATORS
Hoists • Compressors • Transformers
Units of Every Size and Description

WE'LL SELL, BUY OR TRADE
PHONE CANAL 6-2900

CHICAGO *Electric Co.*

1324 W. CERMAK ROAD
CHICAGO 8, ILL.

FOR SALE

Two 125 HP General Electric Motors

550 volt, sixty cycle, three phase, 1165 speed full load, type F T R, model 84-E-196-G-1, number 5455381, and 5455388.

Write

FS-3084, Electrical World
330 W. 42 St., New York 36, N. Y.

TRANSFORMERS

STOCK SHIPMENT
1 KVA—7500 KVA

—SPECIAL—
100 15 KVA Air 440/220 - 110/220

CASH FOR YOUR SURPLUS

ELECTRIC EQUIPMENT CO.
P. O. Box 51, Rochester, N. Y.
WORLD'S LARGEST INVENTORY
MOTORS • GENERATORS • TRANSFORMERS

SUBSTATION EQUIPMENT

TRANSFORMERS

Qu.	KVA	MFR.	VOLTAGE
2	3333	Westl.	132000—7620/13200 Y
3	1000	Wag.	69000—7200/12470
3	75	A. C.	66000/24000—7200/12470 Y
4	2500	Westl.	44000—11000
9	1500	Wag.	44000—6900 NEW
3	200	Mol.	44000/22000—440/220
3	100	G. E.	44000—2300
3	75	Westl.	44000—7200/12470 Y
3	8333	Westl.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
6	1500	Pitts.	33000—2400
9	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000 Y
3	50	Kuhl.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13280/23000
9	50	G. E.	22000—2300/4000
3	971½	G. E.	22000—6900
2	25	G. E.	22000—6900
2	667	Pitts.	13200—2200
3	200	Mol.	11000—2300
9	667	Kuhl.	7200/12470 Y—2400
3	100	Westl.	7200/12470 Y—2400
4	50	G. E.	7200/12470 Y—2300
3	150	Wag.	6900—2300
3	500	Pitts.	6600—550
3	200	G. E.	6900/11430—575
1	100	G. E.	2300—575, 3 ph.

INDUCT. REGULATORS—OUTDOOR

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2— 46 KVA West. 200/400 A. 2300 V.
6— 36 KVA G. E. 150/300 A. 2400 V.
2— 36 KVA G. E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

1— 600 A.173 KV G. E. FHKO-236-500 MVA
2— 600 A.137 KV G. E. FHKO-236-500 MVA
1—1200 A. 15 KV G. E. FKO-139-350 MVA
1— 600 A. 15 KV G. E. FKO-139-350 MVA
2— 600 A. 15 KV G. E. FHKO-136-132BS8
2— 400 A. 15 KV G. E. FKO-37-40
4— 600 A. 15 KV G. E. FHKO-139-750 MVA

BREW, WOLTMAN & CO., INC.

52 Church St. New York 7, N. Y.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

ELECTRIC CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular supplier.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
2879 N. Clybourn Ave. Chicago 14, Ill.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	—6000	Al. Ch.	Condensing 200/250 I.S.P.2300 v. 3/60 Exc. & Surf ne Cond.
1	—750	G.E.	Condensing — 425 lbs. 750 TT I.S.P. 440V. 3 ph. 60 cy.—Built 1944
1	—500	Moore	Non-condensing, 150 [illegible]S.P. 5/35 lbs. G.B.P. 3/60 480 volts Direct Connected Exciter
1	—400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1	—300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUC CONDENSERS

KVA	Make	Type	Volts	Speed
1—3000	Wlms.		2400/4150	600

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	600	2300
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2300, 4400
1—	1000	G.E.	900	260	4100/6900
1—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	240	G.E.	1200	250	2300
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	125	2300
1—	140	Cr. Wh.	890	125/250	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—3000	Pitts	OISC	3	13250x14600/2300
15—1250	Whse	OASC	3	13200x525
3—1250	G.E.	HVDDJ	1	6600x550
3—1000	Pitts	OISC	1	22000x13200/2300
3—1000	GE	HVDDJ	1	22000x6600
3— 800	A.C.	OISC	1	13200/2300

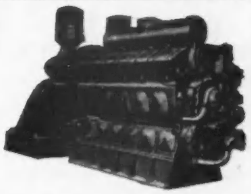
BELYEA COMPANY, INC.

OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

DIESEL POWER

FOR
IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	38FH8	2000	300	375	Enterprise	1SG-6	450	450
1420	Fairbanks Morse	38D8¼	1600	720	330	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
825	Alco	6-12¼x13T	750	600	125	Ingersoll Rand	[illegible]	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6046C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd St., NORTH BERGEN, N. J. N. Y. C. Tel. LOngacre 5-3727 N. J. Tel. UNion 3-7600

TRANSFORMERS

1—1500 KVA Whse., 3 Ph., 33,000/[illegible]/2400/480V. HT taps
1—1500 KVA G.E., 3 Ph., 4150V. 2300V Pyranol
3— 400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1— 200 KVA G.E., 3 Ph., 2460-220 Sec.
3— 100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
2— 100 KVA Newark, 440V 3 Ph., 220V 2 Ph.
6— 50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.
2—37½ KVA Allis, Air, 1 Ph., 450V pri., 120V sec.
2— 25 KVA G.E., 1 Ph., 11,500V pri., 230/460V sec.

SYNCHRONOUS MOTORS

1— 360H.P., Elec. Mach. 720 RPM. 3 Phase 60 cyc., 2300V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V. 900 R.P.M., 230 V. Syn.
1— 175 KVA West., 1 Ph., 2300V. Sefor 3 Ph., 480V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1 75 KW Crocker Wheeler, 250V, 1200 RPM, 2300/4150V Syn.

SLIP RING MOTORS

1—2500 HP G.E., MT, 257 RPM 6600V.
1— 250 HP West., C.W. 880 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2300V with D.C. EXC.

Large Stock of A.C. and D.C. Equipment

—TRANSFORMERS—

BOUGHT AND SOLD

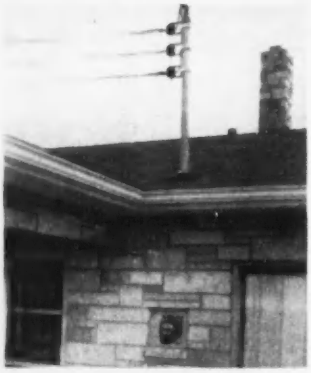
We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

LETTERS TO THE EDITOR



SERVICE RISER INSTALLATION

Ranch-House Service

To the Editor:

Your comments in the November 19, 1951, issue of your Technical Notes column regarding service risers for low roofed houses are very interesting indeed, particularly since we believe we have solved this service problem.

We have offered for about two years a complete packaged kit which includes everything required for such service riser installation excepting only the weatherhead and plumbers' flashing for the roof. Our service masts are of rugged design.

Our whole approach to this problem was with permanence in mind. For instance, we have been asked many times to design fittings to take 2-in. conduit but have refused to do so because of the practical certainty of some contractor using 2-in. on services where higher strength is needed.

George C. Price
President

Electrical Mfg Co
Battle Creek, Mich.

Channels Not Unlimited

To the Editor:

As a faithful reader of Electrical World I enjoyed the very fine article in the November 5, 1951 issue entitled "What If This Fall Brings Another 'Big Blow'?"

I believe, however, that there may be in the paragraph under Emergency Communication on page 117, beginning with the sentence "Congestion that existed on another radio system is being relieved by assigning separate frequencies to radios used by underground and overhead divisions" the cause of grave misunderstanding . . . I am afraid [some utility people will] be under the impression that there may be unlimited reservoir of channels from which additional assignments can be made in accordance with the desires or needs of any applicant for such channels.

In the Middle Atlantic area assignments have been made on an adjacent basis in the 152-162 Mc block, which means that utilities in the same geographic area are operating with transmitters only 60 kc apart. With a power limit of 50-w output, such operation is just barely possible in that there is a certain degree of breakthrough when mobile units on one channel are operating in close proximity to an adjacent channel receiving antenna. According to our findings, no manufacturer of so-called adjacent channel equipment has yet entirely attained the desirable criterion if the 15-kc swing is adhered to in the transmitter, unless receiver sensitivity is reduced.

Reduction in the transmitter swing at present will reduce the breakthrough nuisance factor, but it will reduce both the range of the receiver signal and its intelligibility, when compared with sets of earlier design in which the 15 kc swing was exceeded and in which broader bank receivers were used. We have attempted to use 7½ and 10-kc receivers but severe clipping and loss of intelligibility has resulted.

The FCC is now talking about split channel operation as an expedient to secure additional channels to meet the ever-increasing demand of all mobile services. With such a decrease in channel spacing, it appears that 7½ kc or 5 kc swing required will result in a degraded service for all users.

If we are to be guided by the remarks of Commissioner Webster at the IRE meeting at Chicago, October 25-6, 1951, it would be well for present occupants of channels in the mobile services not to apply for additional channels because the Commission just does not have the channels to assign in accordance with your November 5th statement.

Manufacturers of mobile equipment indicated at the meeting that split channel operation may be possible, but none gave assurance that adjacent channel interference will be avoided unless an inferior grade of service is to be expected. With the reduced swing necessary with 20 or 30 kc channel spacing, reduced ranges, intelligibility, or breakthrough on the additional channel can be the only result. Along with the reduced swing necessary, all of the advantages which FM radio now has over AM radio will be lost.

G. F. Schiffnayer

80 Park Place
Newark, N. J.

Farm Market Reprints

To the Editor:

We want to offer our congratulations for the excellent special report in the December 3 issue of the Electrical World concerning the farm market.

Our company is considering sending copies of your special report to all of our farm customers. Please advise us if you can send us reprints in the quantity of 5,000 and 6,000.

M. P. Griffith
Assistant Vice President

Citizens Utilities Co
Greenwich, Conn.

No Grounds for Report

To the Editor:

An item in your December 17, 1951 issue, page 78, headed "That Accounts for It" brought to mind a story that came out of South Philadelphia some months ago.

A member of management called to his office one of the men in Works Engineering and said he had a report from Accounting that two electricians had been worked a full Sunday cleaning up the yard. Obviously this was a horrible waste and misuse of overtime bonus. Although the manager was decent about it, he did feel that the matter should be thoroughly investigated.

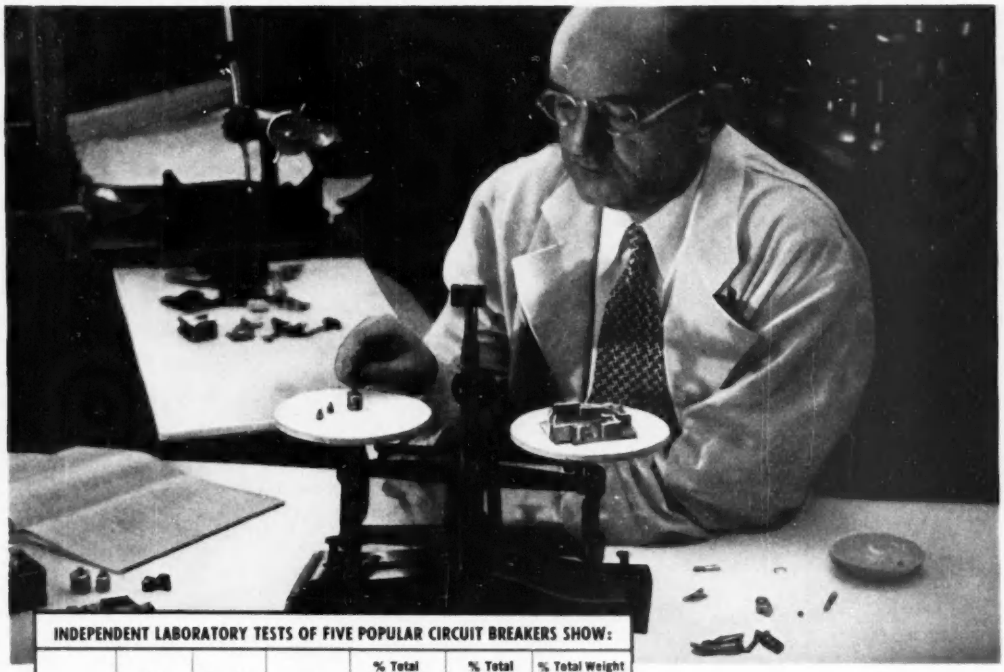
The works engineer investigated and found that the electricians had written up their time cards "Clearing grounds."

A. S. Compton
Works Engineering Dept

Westinghouse Electric Corp
South Philadelphia, Pa.

MILLIONS of **Stab-lok** *CIRCUIT BREAKERS...*

PROVEN FACTS SHOW WHY



INDEPENDENT LABORATORY TESTS OF FIVE POPULAR CIRCUIT BREAKERS SHOW:

Brand	Total No. of Parts	No. of Fibre Parts	% Total Weight	% Total Weight of Case and Handle	% Total Weight of Metal Parts	% Total Weight of Current Carrying Assemblies
STAB-LOK	22	1	100.0	100.0	100.0	100.0
C	31	5	82.2	76.8	88.0	53.8
E	24	2	83.8	80.4	83.3	46.7
B	28	1	85.4	56.0	97.6	48.7
D	31	5	82.2	76.8	88.0	53.8

Federal Noark Stab-loks pass the same Underwriters' Laboratories electrical tests as the highest priced A.C. circuit breakers. And now (as shown above) mechanical comparisons of the five most popular breakers give added proof that Stab-lok is today's best buy. Among other outstanding features:

- **Stab-lok is a BIG, FULL-SIZE CIRCUIT BREAKER!**
- **Stab-lok has FEWER and MORE RUGGED PARTS!**
- **Stab-lok uses metal where it counts — CARRYING CURRENT!**

In only a year and a half, millions of Stab-loks have gone into service and the demand is growing by leaps and bounds. And no wonder!

Stab-lok sells at fuse box prices . . . and utility records show that circuit breakers cut down service calls by almost 90% below those required for fused equipment! Also, beyond affording your customers the safest, most convenient circuit protection, Stab-lok is the lowest priced breaker whose dependability has been absolutely proven in service.

Order Stab-loks now from your wholesaler.

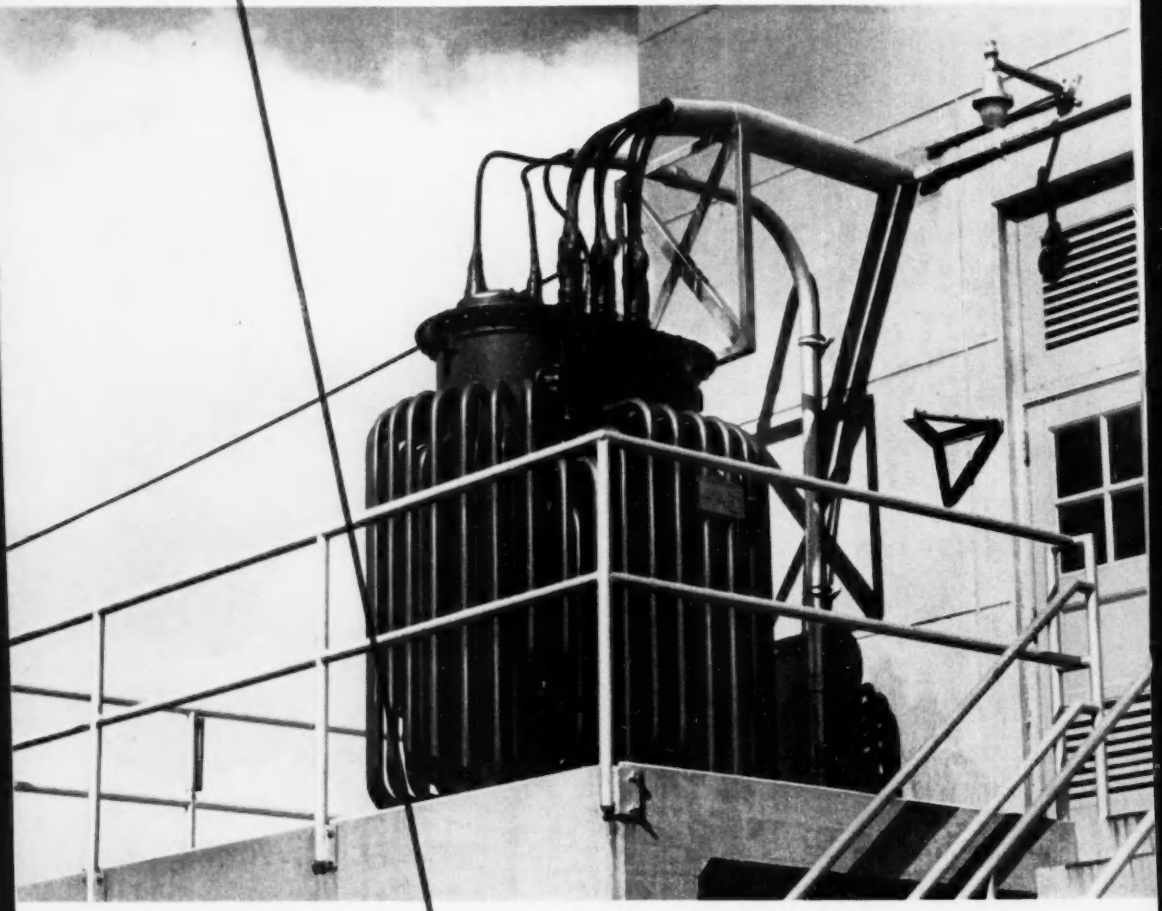
FEDERAL ELECTRIC PRODUCTS COMPANY • 50 Paris Street, Newark 5, N. J.

FEDERAL NOARK

Federal NOARK

Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

MORE POWER FOR THE SOUTHWEST



This Kuhlman Power Transformer is helping to supply the over 100,000 KVA wallop of a new generating plant recently put in operation by a leading southwest utility. • One of the largest power plants in this part of the country, this new station will supply additional energy for Arkansas and Oklahoma and will also interchange power with Kansas and Texas companies. It is equipped with two 50,000 KW hydrogen cooled, turbine driven generators. The 750 KVA Kuhlman Transformer shown, together with another unit of the same rating, serve the motors on the generator cooling tower fans. • Kuhlman Transformers are on the job throughout America and in foreign countries—wherever electrical power and distribution requirements must be met. There is a Kuhlman representative near you. Contact him the next time you have a transformer requirement. • The complete Kuhlman line covers power, distribution, dry type, Saf-T-Kuhl and specialty transformers. Write today for descriptive bulletins.

Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

112

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,*
67 Broad Street, New York 4, N. Y. Cable Address, Microphone, N. Y.